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Author(s):	McGehee, Ellen D.
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Title

DRAFT

**A Plan for the Management of the Cultural Heritage at
Los Alamos National Laboratory, New Mexico**

Prepared by

**Resources Management Team,
Environmental Stewardship Group**



Prepared for

**The Department of Energy/National Nuclear Security
Administration, Los Alamos Field Office**

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Cover photo: Entrance into Los Alamos during the 1940s

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Executive Summary

The Cultural Resources Management Plan (CRMP) for Los Alamos National Laboratory (LANL) is an institutional comprehensive plan that defines the responsibilities, requirements, and methods for managing its cultural resources. The CRMP provides an overview of the cultural resources program, establishes a set of procedures for effective compliance with historic preservation laws specific to the cultural heritage at LANL and specific to the mission of the United States Department of Energy / National Nuclear Security Administration Los Alamos Field Offices (Field Office), addresses land-use constraints and flexibility, and makes the public aware of the stewardship responsibilities and steps being taken by the Field Offices for managing the cultural heritage at LANL.

A critical aspect of the CRMP is that of defining strategies by which to increase land-use flexibility in support of the Field Offices' missions at LANL while at the same time effectively managing those cultural resources warranting long-term protection in compliance with the National Historic Preservation Act. The CRMP also provides a 10-Year Road Map that summarizes and prioritizes the steps necessary for Los Alamos National Security, LLC (LANS) (or successor), and the Field Office to manage these cultural resources, listing both short-term projects and long-term programmatic goals. The LANS Environmental Stewardship Services Group's Resources Management Team is tasked with assisting the Field Office in meeting federal historic preservation compliance mandates, and the CRMP defines roles and relationships in the compliance process.

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Acronyms and Abbreviations

ACHP	Advisory Council on Historic Preservation
AEC	United States Atomic Energy Commission
AIRFA	American Indian Religious Freedom Act of 1978
APE	area of potential effect
ARPA	Archaeological Resources Protection Act of 1979
Caldera	Valles Caldera
CCC	Civilian Conservation Corps
CFR	Code of Federal Regulations
CGRP	Cerro Grande Rehabilitation Project
CRMP	Cultural Resources Management Plan
D&D	decontamination and decommissioning
DARHT	Dual-Axis Radiographic Hydrodynamic Test (facility)
DOE	United States Department of Energy
DOI	United States Department of Interior
DSA	Decision Support Application
ENIAC	Electronic Numerical Integrator and Computer
ENV	Environmental Protection Division
EO	executive order
EOC	Emergency Operations Center
EPC-ES	Environmental Stewardship Services Group
ER	Environmental Restoration (project)
EX-ID	excavation/fill/soil disturbance permit request
Field Office	DOE/NNSA Los Alamos Field Office
FONSI	finding of no significant impact
FY	fiscal year
GIS	Geographic Information System
GPS	Global Positioning System
HABS	Historic American Building Survey

HAER	Historic American Engineering Record
HALS	Historic American Landscape Survey
HE	high explosives
IRT	Integrated Review Tool
IWD	integrated work document
Laboratory	Los Alamos National Laboratory
LA-CP	Los Alamos controlled publication
LAMPRE	Los Alamos Molten Plutonium Reactor Experiment
LANL	Los Alamos National Laboratory
LANS	Los Alamos National Security, LLC
LANSCE	Los Alamos Neutron Science Center
LASL	Los Alamos Scientific Laboratory
LASO	Los Alamos Site Office
LA-UR	Los Alamos unlimited release
LC&T	Land Conveyance and Transfer (Project)
LIDAR	light detection and ranging
MANIAC	Mathematical Analyzer, Numerical Integrator, and Computer
MAP	Mitigation Action Plan
MOA	memorandum of agreement
MOU	memorandum of understanding
NAGPRA	Native American Graves Protection and Repatriation Act of 1990
NDAA	National Defense Authorization Act
NEPA	National Environmental Policy Act of 1969
NHL	National Historic Landmark
NHPA	National Historic Preservation Act of 1966
NM 4	New Mexico State Road 4
NM 501	New Mexico State Road 501
NMCRIS	New Mexico Cultural Resources Information System
NMHPD	New Mexico Historic Preservation Division
NNSA	National Nuclear Security Administration

NPS	National Park Service
NTS	Nevada Test Site (presently called Nevada National Security Site)
OUO	official use only
PA	programmatic agreement
PARP	Pajarito Archaeological Research Project
PR-ID	Project Requirements Identification System
PRS	potential release site
RCRA	Resource Conservation and Recovery Act
Register	National Register of Historic Places
RFI	RCRA facility investigation
RMT	Resources Management Team
Road Map	10-Year Road Map
SAFE	Safeguards Division
SAFE-1	Safeguards Division Classification Group
SEA	Special Environmental Assessment
SHPO	State Historic Preservation Officer
SOP	standard operating procedure
START	Strategic Arms Reduction Treaty
SWEIS	Site-Wide Environmental Impact Statement
SWMU	solid waste management unit
TA	Technical Area
TCP	traditional cultural property
THPO	Tribal Historic Preservation Officer
TYSP	Ten-Year Site Plan
UCLA	University of California at Los Angeles
UHTREX	Ultra High Temperature Reactor Experiment
USC	United States Code
UTM	Universal Transverse Mercator (coordinate system)
WWII	World War II

Part I. Background

Los Alamos National Security, LLC, (LANS) is tasked with assisting the United States Department of Energy (DOE)/ National Nuclear Security Administration (NNSA) Los Alamos Field Office (Field Office) in complying with applicable federal and state historic preservation laws at Los Alamos National Laboratory (LANL or the Laboratory). This Cultural Resources Management Plan (CRMP), which is divided into 25 sections grouped into 6 parts, defines the relationships and specific roles in this compliance process.

Part I. Background. Sections 1–7 provide background information for the CRMP.

Section 1 describes the purpose of the CRMP.

Section 2 discusses applicable historic preservation laws, regulations, guidelines, and policies.

Section 3 provides a glossary of commonly used cultural-resources management terms.

Section 4 briefly describes the physical and environmental setting of LANL.

Section 5 presents a summary of Pajarito Plateau culture from the earliest known occupations of the Paleoindian period 10,000 years ago through that of the Manhattan Project and the Cold War, defined here as ending in 1990.

Section 6 lists the numbers and types of historic properties at LANL and provides brief descriptions of each general type.

Section 7 presents a summary of a major data recovery project conducted during 2002–2006 as part of the DOE Land Conveyance and Transfer (LC&T) Project.

Part II. National Historic Preservation Act Compliance: Section 106. Sections 8–11 address how LANL accomplishes compliance with Section 106 of the National Historic Preservation Act of 1966 (NHPA).

Section 8 presents an overview of Section 106 of the NHPA, the most powerful of the historic preservation laws. Section 106 requires federal agencies to take into account the effects of their undertakings on historic properties and establishes the State Historic Preservation Officer (SHPO) as regulators for compliance with the law.

Section 9 presents the revised and streamlined process by which DOE complies with the requirements of the NHPA Section 106 project review. The cultural resources project review system is outlined, including the LANL Project Requirements Identification System (PR-ID) and excavation/fill/soil disturbance permit requests (EX-IDs), both of which are part of the LANL Integrated Review Tool. Key components of the streamlined LANL-specific compliance process include the following:

- A list of LANL-specific property types and undertakings exempt from review
- A LANL-specific description of ineligible archaeological site categories
- Annual reporting to the SHPO to include “No Property/No Effect”, “No Effect Through Avoidance” (all eligible properties within the area of potential effect [APE] will be

avoided by project activities), for archaeological surveys with negative findings, and for “No Adverse Effect” undertakings involving mission-related upgrades to buildings and structures

- Letter and appropriate documentation to the SHPO for undertakings having “No Adverse Effect” to areas within the boundaries of large, diffuse artifact scatters and other sites with little potential for subsurface deposits and with less than 5 percent of the site disturbed when archaeological monitoring is conducted during the undertaking
- Standard in-field data recovery procedures for adverse effects to specific archaeological site types
- Standard documentation measures for adverse effects to historic buildings and structures (except for exceptionally significant properties identified in Section 10)
- Letter and appropriate documentation to the SHPO of preliminary documentation for projects related to historic building mission changes or closures
- Email communication (from the Field Office to SHPO) for Section 106 notifications regarding implementation of standard in-field data recovery and historic building standard documentation resolving adverse effects (exceptions identified in Section 9)
- An annual report due at the end of the calendar year.

Section 10 outlines the methods used to evaluate, document, and manage post-1942 historic buildings and structures, in compliance with the NHPA. It discusses the role of historic contexts, identifies the process for assessing historic significance and integrity, and lists standard requirements for documenting historic structures and buildings to be used in lieu of memoranda of agreement (MOA) in the case of adverse effect undertakings.

Section 11 outlines the conduct of archaeological resources management at LANL with an emphasis on standards, procedures, and goals as it addresses the methods used to evaluate, document, and manage archaeological sites in compliance with the NHPA. This section provides an outline of the significance standards for archaeological sites, along with a discussion of their application to specific project research designs, data recovery plans, and associated comprehensive agreements. The section also highlights the methods associated with archaeological surveys, general fieldwork for excavations, and archaeological laboratory procedures.

Part III. National Historic Preservation Act Compliance: Section 110. Sections 12–16 address how DOE accomplishes compliance with Section 110 of the NHPA at LANL.

Section 12 presents an overview of NHPA Section 110. Section 110 broadly sets out the historic preservation responsibilities of federal agencies. In Section 110, the NHPA also establishes the Advisory Council on Historic Preservation (ACHP) as a federal watchdog for NHPA compliance.

Section 13 discusses the conduct and status of archaeological surveys at LANL.

Section 14 describes issues and responsibilities for compliance with 36 Code of Federal Regulations (CFR) Part 79, Curation of Federally Owned and Administered Archaeological

Collections. These collections include artifacts and samples that have been recovered from various survey, testing, and excavation programs and the field and laboratory records associated with these materials. Currently, the Museum of Indian Arts and Culture, the Laboratory of Anthropology at the Museum of New Mexico, and the Bradbury Science Museum are the designated repositories for LANL collections. Artifacts dating to the Manhattan Project and Cold War constitute an important exception to this collection policy. Such artifacts are collected, evaluated, and curated in conjunction with the Bradbury Science Museum in Los Alamos.

Section 15 discusses management goals for properties at LANL that have exceptional national significance and may warrant the designation of National Historic Landmarks. The 2014 National Defense Authorization Act signed by President Obama provided legislation for the creation of the Manhattan Project National Historical Park. Los Alamos is one of three locations selected to represent the park, which will be jointly administered by the National Park Service, the United States Department of Interior (DOI) and DOE through an MOA signed November 10, 2015.

Section 16 recommends the designation of National Register Archaeological Districts at LANL. These districts would be complementary to but separate from the National Historic Landmark site areas. Sites with significant archaeological resources from the Homestead period would be designated as National Register Archeological Districts, in addition to Archaic and Ancestral Pueblo period sites (Machen et al. 2011).

Part IV. Native American Consultation and Outreach. A number of laws require various types of consultation with culturally affiliated, federally recognized Native American tribes.

Section 17 provides information on Native American consultation and outreach programs. It provides a detailed discussion of cultural affiliation as it relates to Ancestral Pueblo archaeological sites and human remains at LANL. The Pueblo de San Ildefonso, the Pueblo de Cochiti, and Santa Clara Pueblo claim affiliation with portions of LANL property, while Jemez Pueblo is recognized as affiliated with the Fenton Hill parcel. The Jicarilla Apache Nation and possibly the Mescalero Apache Tribe are also affiliated with archaeological sites in Rendija Canyon and perhaps elsewhere at LANL. All of the northern New Mexico pueblos, along with the Hopi Nation in Arizona and the Pueblo of Ysleta del Sur in Texas, are considered affiliated with sites dating to the Archaic period. This section also considers issues relating to the Native American traditional cultural properties, the Native American Graves Protection and Repatriation Act, NHPA Section 106 consultation, and various outreach programs.

Part V. Strategic Planning and Long-Term Management Issues and Goals. Sections 18–22 address issues concerning strategic planning and aspects of the long-term management of cultural resources at LANL.

Section 18 notes that cultural resources management must be integrated with strategic planning initiatives. This includes integration with the Ten-Year Site Plan, the Long-Term Strategy for Sustainability and Stewardship, the Site-Wide Environmental Impact Statement, and other strategic planning efforts.

Section 19 discusses the importance of working with the SHPO to complete the National Register of Historic Places (Register) eligibility determinations for previously identified

archaeological sites that have not yet been evaluated, and to potentially reassess the boundaries and integrity of previously documented sites that were not recorded and evaluated to modern standards for eligibility. The purpose of moving forward to complete these evaluations is to increase land-use flexibility in support of the DOE/NNSA at LANL, while focusing on those resources most needing long-term management and protection.

Section 20 outlines the rationale and steps for long-term monitoring and protection of key archaeological sites and historic buildings and structures, as required under the Archaeological Resources Protection Act and Section 110 of the NHPA. Efforts in this regard include monitoring of those resources noted in Section 15 as being worthy of National Historic Landmark status and periodic monitoring of the potential National Register Historic District sites introduced in Section 16.

Section 21 discusses public education, interpretation, and outreach.

Section 22 outlines emergency management issues at LANL. The May 2000 Cerro Grande fire and the June 2011 Las Conchas fire required coordinated strategic planning for emergencies to reduce the likelihood of unintentional damage to cultural resources.

Part VI. Safety, Security, and Quality Assurance. Sections 23–25 deal with issues of safety, security, and the quality of processes and products associated with the cultural resources program.

Section 23 summarizes the commitment DOE and LANS have to ensuring that field, laboratory, and office work is conducted in a safe and secure manner.

Section 24 describes the administrative record that will be maintained for certain aspects of the cultural resources program (e.g., Native American consultation and formal consultation with the SHPO and the ACHP).

Section 25 describes how all work performed by and on behalf of the cultural resources program will be guided by specific standards and procedures and by a general quality assurance program plan.

Appendix A consists of a 10-Year Road Map (Road Map) for the CRMP that lists short-term projects and ongoing programmatic goals. The Road Map identifies specific cultural resource priorities that support LANL mission requirements while complying with federal historic preservation laws.

Appendix B contains the document entitled *Archaeological Site Significance and Eligibility Standards* (2015), which provides the basis to evaluate the eligibility of archaeological sites located at LANL. This document addresses Register eligibility by site type and discusses situations where sites have lost their research information potential or integrity and are no longer eligible to be included in the Register.

Section 1. Purpose of the Cultural Resources Management Plan

Los Alamos National Security, LLC, is the management and operating contractor at LANL for the Field Office. LANL consists of approximately 39 square miles of the Pajarito Plateau,

adjacent to the Jemez Mountains in northern New Mexico. LANL is subdivided into 49 technical areas (Figure 1.1). The CRMP is designed to provide a practical and user-friendly set of steps and procedures for complying with federal historic preservation laws and regulations and with DOE policies and directives relating to cultural resources at LANL. A critical aspect of the CRMP is that of defining strategies by which to increase land-use flexibility in support of the Field Offices' missions while at the same time most effectively managing those cultural resources identified for long-term protection. Although historic preservation laws mandate that all cultural resources be properly evaluated for their integrity and significance, these same laws recognize that not all historic properties are eligible for listing in the Register (described below) or are of equal significance and value.

There are about 1900 known historic properties at LANL. The great majority of these sites represent the villages, farmsteads, resource exploitation areas, rock art panels, trails, and shrines of more than 10,000 years of Native American use of the Pajarito Plateau, knowledge of which is still actively preserved in the living memory of modern Pueblo neighbors and other nearby tribes. The Ancestral Pueblo remains are themselves of such cultural richness and significance that in the early 1900s the lands now occupied by LANL were included in the then-proposed Pajarito Park, which, because of political pressures, was eventually scaled back to that of the present Bandelier National Monument. The other archaeological sites at LANL represent the remains of homes, wagon roads, trails, trash scatters, fences, and fields of early 20th-century Hispanic and Anglo homesteaders. In addition, the built environment includes hundreds of historic buildings and structures that represent locations where significant research and development activities took place—beginning with the Manhattan Project in 1943—that helped to define the recent history of the United States and many aspects of the modern technological world.

Cultural resources are historic properties in that they represent an inheritance or legacy from past peoples and events that provide a historical context for the present employees and managers of LANL, for neighboring communities (including homesteader descendants) and Native American tribes, and for the nation. Therefore, the CRMP also provides some information about the nature of these resources and the rationale for why it is important to manage, protect, and preserve these resources. The CRMP is intended to be comprehensive and is organized according to six broad parts, each containing distinct topical sections. The overarching parts include background; compliance with Section 106 of the NHPA; compliance with Section 110 of the NHPA; Native American consultation and outreach; strategic planning and long-term management and goals; and basic safety, security, and quality assurance procedures. The document contains 25 sections and 2 appendixes. Appendix A is a 10-Year Road Map for the CRMP, and Appendix B presents the revised archaeological site significance and eligibility standards for LANL. The Road Map includes both short- and long-term programmatic priorities and will be reviewed on a yearly basis. Any updates to the Road Map will be listed in the annual report to the SHPO.

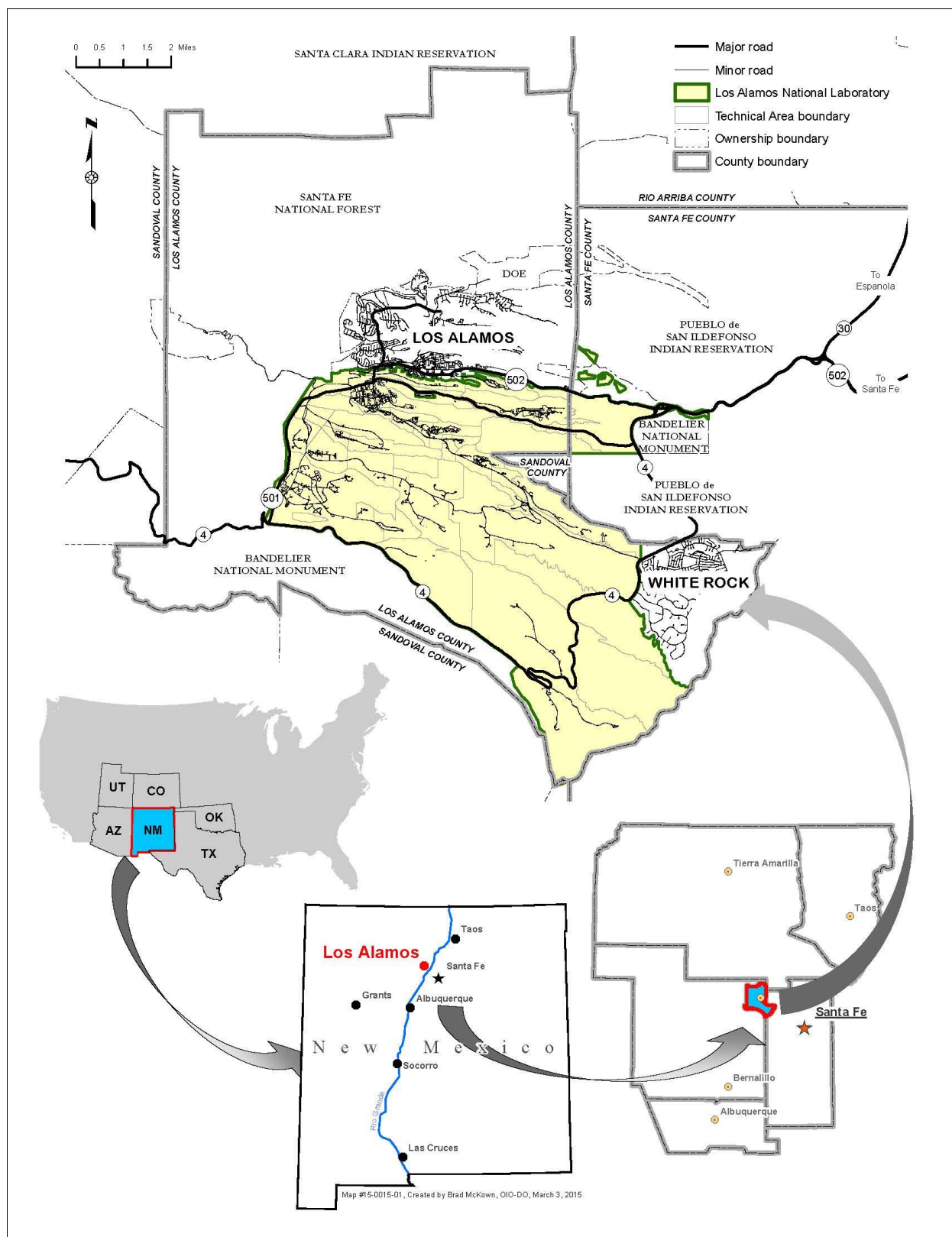


Figure 1.1. Location of Los Alamos National Laboratory

Section 2. Cultural Resources Statutes, Executive Orders and Memoranda, Regulations, Policy, Standards, and Guidelines

More than two dozen federal laws, executive orders (EOs), memoranda, and policies touch upon historic preservation and cultural resources issues; however, only about half of these have substantive application to the lands and operations at LANL itself. These are summarized below.

Statutes

Antiquities Act of 1906 (16 United States Code [USC] 432, 433)

The Antiquities Act was the first federal law to provide protection of historic and prehistoric ruins and monuments and objects of antiquity on federal lands. It authorized the President of the United States to establish national monuments to protect historic and prehistoric structures and objects of historic or scientific interest. It also established a system to permit examination and excavation by qualified researchers to increase knowledge and collect antiquities for permanent preservation in public museums. Penalties were established for unauthorized excavation and collection. Implementing regulations are codified at 43 CFR Part 3. This law protects LANL archaeological sites from illegal excavation but allows for authorized data recovery operations associated with mitigation and/or research in support of the DOE/NNSA missions.

Historic Sites Act of 1935 (16 USC 461)

The Historic Sites Act declared a national policy to identify and preserve historic sites, buildings, objects, and antiquities of national significance. The law authorized the Secretary of the Interior to conduct surveys, collect and preserve data, and acquire historic and archaeological sites. The Historic American Building Survey (HABS) and Historic American Engineering Record (HAER) programs originated from this Act, as well as the National Park Service (NPS) program of designating National Historic Landmark (NHL) Districts.

National Historic Preservation Act of 1966, as amended (54 USC 306108)

The NHPA is the cornerstone of the current federal cultural resource preservation program. It sets forth a general policy of supporting the preservation of historic and prehistoric buildings and properties by the federal government for the benefit and education of the people of the United States. The law states that the federal government will financially and technically assist efforts to preserve aspects of prehistoric and historic heritage in the United States and will administer federally owned historic and prehistoric resources.

The Secretary of the Interior is authorized to expand and maintain a National Register of Historic Places, composed of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, engineering, and culture.

The Secretary is empowered to establish criteria for nominating properties to the Register, designating properties as NHL Districts, considering appeals to recommendations and nominations, nominating historic properties to the World Heritage List, making determinations of eligibility of properties for inclusion in the Register, and notifying property owners and the public when property is being considered for nomination to the Register.

NHPA encourages the development of state preservation efforts and programs, including the establishment of a SHPO. The SHPO is required to identify and inventory historic properties in the state; nominate eligible properties to the Register; implement a statewide preservation program; communicate with the federal and state agencies on matters of preservation; ensure that Register-eligible properties are taken into account during planning and development; and provide information, technical assistance, and education to the public regarding preservation matters.

A grant program established through NHPA provides funds to states for the purpose of identifying historic properties and preserving Register properties. This grant program provides for the operation of the National Trust for Historic Preservation and may allot additional funds for the preservation of NHL Districts threatened with damage or destruction, for public education and training in historic preservation, and to Native American tribes and nonprofit organizations representing ethnic and minority groups for the purpose of preserving their cultural heritage.

NHPA establishes the ACHP. This independent federal agency is required to advise the President, the Congress, and other federal agencies on matters relating to historic preservation; encourage public education and participation in historic preservation; and review historic preservation policies and programs of federal agencies in order to improve their effectiveness and efficiency.

Section 106 of NHPA requires federal agencies to take into account the effect of any federal or federally funded undertaking on any district, site, building, structure, or object that is included in or is eligible for inclusion in the Register. The ACHP must have an opportunity to comment on the undertaking's effect on historic properties unless it is determined by the federal agency that there is no effect or no historic property involved in the undertaking. Federal agencies must take into account the effects of their undertakings on cultural resources at the planning stage and provide for protective measures or other mitigation and treatments for any affected resources. The implementing regulations for Section 106 are contained in 36 CFR Part 800.

Section 110 of NHPA requires the heads of all federal agencies to assume responsibility for the preservation of historic properties located on the agency's property or controlled by the respective agency. Each federal agency is required to undertake a program to locate, inventory, and nominate to the Secretary of the Interior all properties owned or under control of the agency that appear to qualify for inclusion in the Register. Historic properties must be recorded and documented in the event of their damage or destruction due to any federal agency activity, including routine demolition as part of infrastructure development. Each federal agency is required to designate a qualified official as a preservation officer who will coordinate preservation activities of the agency. Costs of preservation efforts may be included in the planning efforts of any undertaking by a federal agency. The federal preservation officer resides at DOE Headquarters in Washington, D.C.

Section 112 of NHPA requires that any agency responsible for the protection of historic properties ensure that all actions taken on these properties are done by people meeting professional standards developed by the Secretary of the Interior. These standards apply to both agency and contract personnel. Data and records produced through historical research shall be permanently curated in appropriate databases and will be available for use by researchers. Finally, this section requires that federal historic preservation activities include plans to promote protection and preservation of historic properties to the public.

Section 304 of NHPA allows an agency to withhold information about the location, character, or ownership of a historic resource from disclosure to the public if the agency determines that such disclosure may cause a significant invasion of privacy, risk harm to the historic resource, or impede the use of a traditional religious site by practitioners.

NHPA's definition of historic properties includes archaeological sites, buildings, structures, districts, and objects that are prehistoric or historic in age. In the southwestern United States, the break between prehistory and history occurred in the 16th century, when written records were produced by Spanish explorers. Native American oral traditions also provide historical accounts of earlier periods. Historic properties ordinarily must be at least 50 years old, but younger properties of exceptional importance may also be included as cultural resources worthy of consideration for Register eligibility under NHPA.

Traditional cultural properties (TCPs) are a particular class of cultural resource, specifically recognized as such in the 1992 amendments to NHPA. TCPs are places of special heritage value to contemporary communities because of their association with the cultural practices or beliefs that are rooted in the histories of those communities. These resources are important in maintaining the community's cultural identity and are not limited by age or universal understanding. Sections 101(d)(6) and 101(d)(6)(B) of the NHPA state that properties of traditional religious and cultural importance to a Native American may be determined to be eligible for inclusion in the Register. Further, these sections direct federal agencies, while carrying out their responsibilities under Section 106, to consult with any Native American group that attaches religious and cultural significance to properties that may be affected by a federal undertaking.

In response to the 1992 NHPA amendments, a new policy statement, "Consultation with Native Americans Concerning Properties of Traditional Religious Cultural Importance," was adopted by the ACHP on June 11, 1993. The policy contains guidelines for application of the amendments. In particular, the policy recommends that consultation efforts with Native American groups and other ethnic groups with traditional cultural values be identified using "culturally appropriate methods" and that participants in the Section 106 compliance process learn how to approach Native Americans and others in "culturally informed ways" (ACHP 1993). Consultation with Native Americans must be conducted with sensitivity to cultural values, socioeconomic factors, and the administrative structure of the group. Specific steps are to be taken to address language differences and issues such as seasonal availability or lack thereof on the part of necessary participants. The ACHP's policy statement reaffirms the federal government's commitment to maintaining confidentiality regarding cultural resources and states that participants in the Section 106 compliance process "should seek only the information necessary for planning in a manner that respects the Native American groups need for confidentiality" (ACHP 1993).

National Environmental Policy Act of 1969, as amended (42 USC 4321 et seq.)

The National Environmental Policy Act (NEPA) establishes a national policy that encourages harmony between humans and the environment. This policy states that the federal government shall use all practicable means to preserve the productive harmony of the environment while fulfilling social, economic, and other requirements of generations of Americans. Included in preserving the environment is the preservation of important historic and cultural aspects of national heritage. The aim of the Act is to have full disclosure of the decision-making process.

NEPA requires all federal agencies to prepare a statement that assesses the impact of any proposed action on the environment, including any unavoidable adverse environmental effects, and to present alternatives to the proposed action before implementing the proposed action. This statement shall be prepared as early in the planning process as possible and shall accompany the action's proposal through the agency review process, ensuring that environmental concerns are addressed in the decision-making process.

Implementing regulations issued by the Council on Environmental Quality are codified at 40 CFR 1500-1508. DOE has published counterpart regulations that are codified at 10 CFR 1021 and in DOE Order 451.1A. These regulations encourage combining NEPA compliance with other regulatory requirements such as those of the NHPA, American Indian Religious Freedom Act of 1978 (AIRFA), and Native American Graves Protection and Repatriation Act of 1990 (NAGPRA).

American Indian Religious Freedom Act of 1978 (42 USC 1996)

AIRFA reiterates the First Amendment recognition of religious freedom for the peoples of the United States. Specifically, it refers to the inherent right of indigenous peoples to believe, express, and exercise their traditional religions, including but not limited to access to religious sites, use and possession of sacred objects, and freedom to worship through ceremonial and traditional rites.

Federal departments, agencies, and other instrumentalities are directed to evaluate their policies and procedures in consultation with native traditional religious leaders to determine appropriate changes necessary to protect and preserve Native American religious cultural rights and practices. LANS and DOE work to plan activities so that they do not disrupt or adversely affect the practice of traditional religions. Tribal groups receive advance notification of major construction activities and are requested to inform the Field Office if these activities would affect a TCP. DOE provides access to resource collection areas for ceremonial activities and hunting.

Archaeological Resources Protection Act of 1979, as amended (16 USC 470aa et seq.)

The Archaeological Resources Protection Act (ARPA) establishes that archaeological resources on public and Indian lands, which are threatened by unauthorized excavation and looting, are a part of the nation's heritage and should be preserved for the benefit of the American people. The law encourages cooperation between individuals possessing private artifact collections and the archaeological community.

ARPA specifically protects any material remains of past human life of archaeological interest and at least 100 years old, including pottery, basketry, bottles, weapons, weapon projectiles, tools, structures or portions of structures, pit houses, rock paintings, rock carvings, intaglios, graves, human skeletal materials, or any portion or piece of any of the above located on public or Indian lands of the United States. Public lands include the National Park system, national wildlife refuges, the National Forest system, and all other lands for which the fee title is held by the United States, including LANL. Indian lands refer to lands of Native American tribes or individuals held in trust by the United States Bureau of Indian Affairs.

Unauthorized excavation, removal, damage, alteration, defacement, or attempts to injure any archaeological resource on public or Indian land are prohibited. No one may purchase, sell, or exchange any archaeological resource derived from public or Indian lands. The law provides criminal and civil penalties for any violation. One such case occurred in the late 1990s on LANL lands, and the individual was successfully prosecuted in accordance with ARPA.

Permits may be obtained from the appropriate federal agency by qualified individuals who propose to excavate or remove archaeological resources from federally owned or controlled land. The proposed work must be undertaken for the purpose of furthering archaeological knowledge for the benefit of the public. Archaeological resources recovered are to remain the property of the United States and must be preserved by a university, museum, or other qualified institution. The appropriate federal land manager must contact any Native American tribe that has a cultural or religious interest in a site proposed to be excavated under permit.

Federal agencies may not disclose any information pertaining to the location of sites which would require an excavation or artifact removal permit unless the disclosure would further the purposes of ARPA or would not create a risk to the condition of archaeological resources on the site. A governor of any state may request location information from federal agencies that control land within the governor's state. Federal agencies must develop plans for surveying lands not scheduled for specific undertakings and implement a system for recording and reporting archaeological violations. Federal managers are required to establish a program to increase public awareness of and the need to protect archaeological resources.

The Secretary of the Interior is charged through ARPA to encourage cooperation and exchange of information among individuals who possess archaeological resources collected before the enactment of the Act, federal authorities responsible for archaeological resource protection, and professional archaeologists.

Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001 et seq.)

The purpose and intent of the NAGPRA is to acknowledge the ownership of certain Native American human remains, funerary objects, sacred objects, and objects of cultural patrimony by Native American tribes or organizations and to treat these remains and objects in a way that is agreeable to these tribes or organizations.

The first provision of NAGPRA covers Native American remains or objects discovered on federal or tribal lands after the date of enactment of NAGPRA. The federal land-managing agency must notify Native American tribes or organizations of the discovery, providing them an opportunity to issue a claim of affiliation to the remains or objects. The tribe or organization determined to have the right of ownership of the remains or objects may then consult with the agency to determine what action should be taken with the remains or objects. The agency is responsible for carrying out these determinations.

The second provision of NAGPRA covers Native American remains or objects possessed or controlled by federal or federally assisted institutions, curation facilities, or agencies. The curation facility shall inventory all of these remains and objects and provide these inventories to Native American tribes or organizations. The tribes or organizations may issue a claim of affiliation to the remains or objects. The tribe or organization determined to have the right of

ownership of the remains or objects may then consult with the curation facility to determine what action should be taken to repatriate the remains or objects. The curation facility is responsible for carrying out these determinations.

NAGPRA also makes provisions for the prosecution of those who knowingly sell, purchase, use for profit, or transport for sale or profit Native American human remains or objects covered in this Act, whether or not they derive from federal or Indian lands.

Omnibus Public Land Management Act of 2009 (Preserve America and Save America's Treasures Programs)

The Omnibus Public Land Management Act of 2009 includes the text of the Preserve America and Save America's Treasures Programs, formerly H.R. 3981/S.2262 in the previous 110th Congress, which permanently authorizes both programs.

The Preserve America program, which includes a grant program, was established during the administration of President George W. Bush when Mrs. Laura Bush served as honorary chair for both initiatives. The Preserve America grant program provides matching funding for education, marketing, planning, and other related efforts for historic interpretation and heritage tourism.

Save America's Treasures grants, established during the administration of President Bill Clinton and championed by First Lady Hillary Rodham Clinton, provide essential funding for restoration and preservation work on nationally significant historic structures and objects.

The Omnibus Public Land Management Act of 2009 authorizes grants of up to \$50 million for Save America's Treasures and up to \$25 million for Preserve America annually. LANL was the recipient of a Save America's Treasures grant in 2005.

2014 National Defense Authorization Act

The National Defense Authorization Act (NDAA), signed into law by President Obama in December 2014, contains a provision that creates the Manhattan Project National Historical Park. The NDAA establishes the Manhattan Project National Historical Park as a unit of the NPS no later than one year after enactment. At LANL, 17 Manhattan Project period properties are currently closed to the public, including V-Site and Gun Site. Several historic properties within the County of Los Alamos are open to the public, including Fuller Lodge, an important community building in use during the Manhattan Project.

Establishment of the park requires the Secretary of the Interior and the Secretary of Energy to enter into an MOU defining the respective roles and responsibilities of the departments in administering the park. The MOU, signed November 10, 2015, includes provisions for enhanced public access, management, interpretation, and historic preservation.

Executive Orders and Memoranda

Executive Memorandum, September 23, 2004

This executive memorandum addresses government-to-government relations with Native American tribal governments. This memorandum complements and partially supersedes the similar executive memorandum of April 29, 1994. To ensure that the rights of sovereign tribal

governments are fully respected, the memoranda set forth guidelines requiring federal agencies to operate within a government-to-government relationship with federally recognized tribal governments. This involves consultation with tribal governments before taking actions that affect those governments and assessing the potential impact of plans, projects, and activities on tribal trust resources. Federal agencies consider tribal government rights and concerns during the development of such programs and activities by working directly and effectively with tribal governments on activities that affect trust properties or tribal governmental rights. Federal programs may be designed to provide unique solutions to address specific needs of tribal communities.

Executive Order 13007, May 24, 1996

Executive order (EO) 13007 concerns Indian sacred sites. In order to protect and preserve Indian religious practices, federal land managers must accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and avoid adversely affecting the physical integrity of sacred sites. A sacred site as defined in EO 13007 is “any specific, discrete, narrowly defined delineated location on federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site.” Federal agencies, where appropriate, shall maintain the confidentiality of sacred sites and will implement procedures to manage these resources.

Executive Order 13175, November 6, 2000 (superseded EO 13084 of the same title)

EO 13175 addresses consultation and coordination with Indian tribal governments. This document states that each federal agency must establish a process for regular and meaningful consultation and collaboration with Native American tribal governments in the development of regulatory matters that directly affect their communities. Policies will take into account tribal self-government, sovereignty, and treaty rights.

Executive Order 13287, March 3, 2003

EO 13287 states as policy that the federal government is to provide leadership in preserving America’s heritage by actively advancing the protection, enhancement, and contemporary use of the historic properties (as defined under the NHPA) owned by the federal government and by promoting intergovernmental cooperation and partnerships for the preservation and use of historic properties.

Executive Order 13514, October 5, 2009

EO 13514 sets sustainability goals for federal agencies and focuses on making improvements in their environmental, energy, and economic performance. The ACHP issued guidance to advise federal decision makers regarding the requirements of Section 2(g) of EO 13514, which charges federal agencies to “implement high performance sustainable federal building design, construction, operation and management, maintenance, and deconstruction including by...ensuring that rehabilitation of federally owned historic buildings utilizes best practices and

technologies in retrofitting to promote long-term viability of the buildings.” This guidance, “Sustainability and Historic Federal Buildings: Integrating the Requirements of the National Historic Preservation Act with the Requirements of Executive Order 13514...,” (DOI 2011) was prepared by a work group comprising staff representatives of the ACHP, Department of Defense, DOI, Department of Veterans Affairs, and General Services Administration.

Regulations

There are a number of regulations that help to implement the intent of the legislation described above. These are largely self-explanatory and will be listed simply by number and title in the Code of Federal Regulations:

- 36 CFR 60: National Register of Historic Places
- 36 CFR 63: Determination of Eligibility for Inclusion in the National Register of Historic Places
- 36 CFR 65: National Historic Landmarks Program
- 36 CFR 67: The Secretary of the Interior’s Standards for Rehabilitation
- 36 CFR 68: The Secretary of the Interior’s Standards for the Treatment of Historic Properties
- 36 CFR 78: Waiver of Federal Responsibilities under Section 110 of the National Historic Preservation Act
- 36 CFR 79: Curation of Federally Owned and Administered Archaeological Collections
- 36 CFR 800: Protection of Historic Properties
- 43 CFR 7: Protection of Archaeological Resources
- 43 CFR 10: Native American Graves Protection and Repatriation Act Regulations

DOE, the Field Office, and LANS Policy

DOE Order 1230.2, 1992, revised 2000

DOE Order 1230.2, “American Indian Tribal Government Policy,” provides general guidance for knowledgeable and sensitive management interactions with federally recognized Native American tribes. The guidance recognizes and commits to a government-to-government relationship between DOE and Native American tribal governments and provides for proactive departmental consultations before actions or decisions that could affect tribes. It also encourages early communication and cooperation with other federal agencies. DOE is required to encourage tribal governments and their members to participate fully in national and regional dialogues that concern DOE programs and issues. Each DOE field office with areas of cultural or religious concern must consult with Native American tribal governments about potential impacts of proposed DOE actions to those resources, while avoiding unnecessary interference with traditional religious practices. Consultation may include, but is not limited to (1) the exchange of information concerning the location and management of cultural resources; (2) repatriation or other disposition of objects and human remains; (3) access to sacred areas and traditional

resources located on DOE lands in accordance with safety, health, and national security considerations; and (4) assessment of potential community impacts.

DOE Order 436.1, 2011

DOE Order 436.1, “Departmental Sustainability,” issued May 2, 2011, defines requirements and responsibilities for managing sustainability. It directs the DOE to carry out its missions in a sustainable manner that addresses national energy security and global environmental challenges and advances sustainable, efficient, and reliable energy for the future. The purpose of the order is to institute wholesale cultural change so that DOE that will factor sustainability and greenhouse gas reductions into all corporate management decisions and ensure that sustainability goals established in its Strategic Sustainability Performance Plan are met. This order cancels DOE Order 450.1A and DOE Order 430.2B.

The Field Office / Pueblo Accords, 1992

The Field Office and LANS have established a special relationship with the Pueblos of San Ildefonso, Jemez, Cochiti, and Santa Clara that recognizes all four as sovereign entities that can interact with each other on a government-to-government basis. Governors from each pueblo and the Assistant Secretary for Defense Programs (on behalf of DOE) signed an accord on behalf of each government. The accords provide a procedural framework for consultation, as well as commitments to provide information and input in long-term planning and decision-making. The Pueblo Accords were revised and restated in 2006.

LANL/Pueblo Cooperative Agreements, 1994–1996 and 2010–2015

LANS signed a set of agreements similar to the Field Office / Pueblo Accords that are referred to as the LANL/Pueblo Cooperative Agreements. The pueblos signing the agreements include San Ildefonso, Jemez, Cochiti, and Santa Clara. The cooperative agreements were revised and restated in 2009–2010. The Pueblo de San Ildefonso signed a new agreement in 2009; the Santa Clara Pueblo, the Pueblo de Cochiti, and the Jemez Pueblo signed new agreements in 2010. The cooperative agreements provide a procedural framework for consultation, as well as commitments to provide information and input in long-term planning and decision-making.

Field Office Management Procedure No. 0.5.09, Rev. 0, 2005

Management Procedure 0.5.09, issued by the Field Office Manager, defines the duties of the Field Office Cultural Resources Program Manager and establishes that Manager’s relationship with LANS cultural resources personnel assisting the Field Office with historic preservation laws compliance.

DOE Policy 141.1, approved May 2, 2001

DOE Policy 141.1, “Department of Energy Management of Cultural Resources,” issued by the DOE in 2001, is designed to ensure that DOE programs, including field elements (such as LANL), integrate cultural resources management into their missions and activities. The policy is also designed to raise the level of awareness and accountability among DOE contractors concerning the importance of the Department’s cultural-resource-related legal and trust responsibilities.

This policy states that preservation and protection of America's cultural heritage are important functions and responsibilities of the federal government for properties under its control or jurisdiction. This policy helps ensure that DOE maintains a program that reflects the spirit and intent of the legislative mandates.

Standards and Guidelines

The NPS has published a number of documents relating to the establishment of standards and professional guidelines for the conduct of archaeological and historical preservation programs by federal agencies. Included among these are The Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation. These standards and guidelines were first published in the Federal Register in 1983 (48 FR 44716) and have since been slightly modified and amended.

To the extent practicable, the conduct of archaeology and historic preservation at LANL will adhere to these standards and guidelines. A current list of LANS cultural resources staff members conducting archaeological and historic preservation activities at LANL, along with a brief description of their experience and qualifications, is maintained by LANS and by the Field Office Cultural Resources Program Manager.

In January 2010, the Field Office entered into an MOA with the SHPO to provide the Pueblo de San Ildefonso and Santa Clara Pueblo access to the TCP district located in Rendija Canyon. The MOA affords preservation and protection for the TCP district from future development when the Rendija Canyon Tracts (A-14A, A-14C, and A-14D) are conveyed to the Incorporated County of Los Alamos.

Additionally, the Field Office has entered into an MOA with the Pueblo de San Ildefonso to facilitate a cooperative effort regarding DOE's activities on Pueblo lands within the exterior boundaries of the Pueblo and to provide procedures by which the Pueblo, DOE, and DOE contractors will coordinate and carry out DOE activities. The MOA addresses responsibilities and functions that must be coordinated.

Section 3. Glossary of Cultural Resources Acronyms and Terms

Advisory Council on Historic Preservation (ACHP): An independent federal agency with statutory authority to review and comment on federal actions affecting properties listed in or eligible for the National Register of Historic Places; to advise the President and the Congress on historic preservation matters; and to recommend measures to coordinate activities of federal, state, and local agencies. Its members include Cabinet-level representatives from federal agencies and presidential appointees from outside the federal government.

Accord Pueblos: In 1992, a set of agreement documents was signed between the Field Office and the Pueblos of Cochiti, Jemez, San Ildefonso, and Santa Clara. These four pueblos are often referred to as the Accord Pueblos, and the agreement documents are referred to as the Pueblo Accords. The Pueblo Accords were revised and restated in 2006. Between 1994 and 1996, a similar set of cooperative agreements was signed between LANL and these four pueblos to promote increased communication and dialog between the Field Office / LANS and its pueblo neighbors. The cooperative agreements were revised and restated in 2009–2010.

Area of potential effect: A term that refers to the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking.

Archaeological resources: Any material remains of past human life or activities which are of archaeological interest, including (but not limited to) pottery, basketry, bottles, weapons, weapon projectiles, jewelry, tools and the chipped-stone debris from tool manufacture, structures or portions of structures, pit houses, rubble mounds, rock paintings, rock carvings, intaglios, graves and grave associations, human skeletal materials, or any portion or piece of any of these items. The term also applies to agricultural sites and residue, resource collection sites and residue, and other materials that can provide information about past human lifeways. Under the guidelines of the ARPA, these items must be at least 100 years in age.

Cultural heritage: A term referring to the cumulative set of historical properties and values of specific cultural groups.

Cultural resources: Cultural resources include historic properties as defined in the NHPA, archaeological resources as defined in the ARPA, and cultural items as defined in the NAGPRA.

Environmental Protection and Compliance Division's Environmental Stewardship Services Group (EPC-ES): This LANL group is charged with assisting the Field Office and LANS with compliance and related actions concerning biological, cultural, and environmental planning issues at LANL.

Excavation/fill/soil disturbance permit request (EX-ID): This permit request is the initial step in a general environmental project review process at LANL in which proposed ground-disturbing activities are evaluated for potential impacts to the environment, including historic properties, as part of the NHPA Section 106 review process.

Historic American Building Survey (HABS): A standardized system of records and record keeping for documenting historic buildings.

Historic American Engineering Record (HAER): A standardized system of records and record keeping that produces graphic and written documentation of historically significant architectural, engineering, and industrial sites and structures.

Historic American Landscape Survey (HALS): A standardized system of records and record keeping for documenting historic landscapes.

Heritage resources: See Cultural Heritage term. Heritage resources is an alternate term applied to cultural resources by some agencies.

Historic properties: These are defined as prehistoric (before the arrival of Europeans) or historic districts, sites, buildings, structures, or objects included in, or eligible for inclusion in, the National Register of Historic Places. These include artifacts, records, and remains that are related to and located in such properties.

Historic structure: A building or other structure constructed after AD 1890, including both homestead structures and Laboratory-era buildings and structures that have been evaluated for Register eligibility.

Integrated work document (IWD): A product of the LANL Integrated Work Process system designed to ensure that construction and maintenance activities are carried out in a safe, transparent, and efficient manner.

Los Alamos Field Office (Field Office): The local DOE/NNSA organization charged with direct oversight of LANL operations and compliance with federal historic preservation laws and with DOE cultural resources policy.

Mitigation Action Plan (MAP): A plan for mitigating impacts to cultural resources (one of the NEPA compliance documents).

Memorandum of agreement (MOA): A legal agreement prepared between two federal agencies or a federal agency and other entity (e.g., state or county government, Native American tribe) that specifies various actions and responsibilities on the part of each signatory party, typically for a single, specific project for a specific period of time.

National Register of Historic Places (Register): The nation's master inventory of known historic properties worthy of preservation. The Register is administered by the NPS on behalf of the Secretary of the Interior. Included are buildings, structures, sites, objects, and districts that possess historic architectural, engineering, archaeological, or cultural significance at the national, state, or local level.

National Historic Landmark (NHL): A special category designated by the Secretary of the Interior for historic properties exhibiting exceptional importance in American history, architecture, archaeology, engineering, or culture.

Official use only (OUO): A designation placed on many LANL cultural resources documents and maps indicating the presence of sensitive information (such as archaeological site locations) that must not be released to the general public.

Programmatic agreement (PA): A legal agreement prepared between two or more federal agencies or a federal agency and other entities (e.g., state or county government, Native American tribe) that specifies various programmatic actions and responsibilities on the part of each signatory party, and which is typically subject to periodic review and update. The April 2000 programmatic agreement specifically refers to the PA prepared in April 2000 between the Field Office and the SHPO, and also signed by the ACHP, that streamlined the management of historic properties at LANL and led to the creation of the present CRMP.

Project Requirements Identification System (PR-ID): An electronic system that facilitates the environmental, health, and safety review of proposed construction, remodeling, demolition, and maintenance activities at LANL. Cultural resources reviews through the PR-ID must meet the standards of the NHPA's federal review process outlined in Section 106.

Resources Management Team (RMT): The Resources Management Team, Part of EPC-ES, assists the Field Offices in compliance with historic preservation laws and implementation of the CRMP.

Section 106: Section 106 of the NHPA requires federal agencies to take into account the effect of any federal or federally funded undertaking on any district, site, building, structure, or object that is included in or is eligible for inclusion in the Register. The review process is administered by the ACHP under Section 106 regulations found in 36 CFR 800.

Section 110: Section 110 sets out the broad historic preservation responsibilities of federal agencies and is intended to ensure that historic preservation is fully integrated into the ongoing programs of all federal agencies. It makes explicit the federal agency's responsibility for identifying and protecting historic properties and avoiding unnecessary damage to them.

State Historic Preservation Officer (SHPO): The NHPA established State Historic Preservation Officers as regulators on the state level to ensure NHPA compliance. The New Mexico SHPO is responsible for reviewing planned activities by federal, state, or local entities that may affect historical, cultural, or archaeological resources in New Mexico and for ensuring that those planned activities comply with NHPA Section 106.

Sacred site: A location of religious significance or ceremonial use by Native American religious practitioners and made known to the administering federal agency by an appropriately authoritative representative of a Native American religion.

Traditional cultural property (or place) (TCP): As established by the NHPA, defined as a place of special heritage value to contemporary communities (often, but not necessarily, Native American groups) because of its association with the cultural practices or beliefs that are rooted in the histories of those communities and which is important in maintaining the cultural identity of the communities.

Tuff: Welded (consolidated and chemically bonded) volcanic ash from ancient pyroclastic flows.

Section 4. LANL Physical and Environmental Setting

The Jemez Mountains are located at the intersection of three major physiographic provinces: the southern Rocky Mountains, the Colorado Plateau, and the Rio Grande rift valley. The Valles Caldera is the dominant feature of the Jemez Volcanic Field, active during the past approximately 16 million years, and responsible for the immense quantities of rhyolitic ash that now cap the plateaus and mesas sloping outward from the caldera edge. Volcanic activity is also responsible for the basalt and other igneous materials, including obsidian outcrops located in the Valles Caldera vicinity.

Elevations range from 1676 meters (5500 feet) along the Rio Grande valley to over 3050 meters (10,000 feet) in the Sierra de los Valles and the Valles Caldera. The average growing season is from 120 to 160 days, with annual precipitation averaging from 300 to 450 millimeters (12 to 18 inches). Moisture comes in the form of winter snows and summer monsoonal rainfall. Maximum summer temperatures at LANL average between 90°F and 100°F, with minimum winter temperatures averaging between 15°F and 25°F.

The Pajarito Plateau consists of a series of narrow mesas and deep canyons (Figure 4.1) that trends east-southeast from the Jemez Mountains to the Rio Grande Valley. The defining feature of the Plateau is the Tshirege Member of the Bandelier Tuff, a massive series of ignimbrites, or ash-flow tuffs, which is the result of a series of large eruptions from the Valles and Toledo calderas, about 1.6 and 1.2 million years ago, respectively.



Figure 4.1. Aerial view of some of the mesas and canyons of the Pajarito Plateau

Mesa orientation, solar radiation, and differences in soils and moisture levels contribute to the presence of highly varied ecotones found throughout the Pajarito Plateau. The elevation gradient and the corresponding variable climatic conditions are reflected by the presence of five major vegetation types. These major types are defined by their dominant tree species and by their structural characteristics. These types are juniper savannas, piñon-juniper woodlands, ponderosa pine forests, mixed conifer forests, and spruce-fir forests.

Within these five general vegetation types, there are several specific vegetation communities, which are not primarily influenced by elevation or climatic gradients. These communities are the

aspen forests, grasslands, scrublands, floodplains, open water, and nonvegetated lands. These communities are influenced by a variety of topographic features including soils, geologic structures, and moisture conditions.

Ponderosa pine forests extend to as low as 1890 meters (6200 feet) in some of the topographically protected canyons such as Ancho and Water. In more open canyons, like Sandia and Los Alamos, ponderosa pine is not normally found below 1921 meters (6300 feet). On the mesa tops and the lower slopes of the Sierra de los Valles, ponderosa pine forests extend to 2378 meters (7800 feet) in elevation. The ponderosa pine is the only overstory species found throughout most of the higher elevation range. However, at lower elevations juniper is also present, and at higher elevations an occasional Douglas fir may be found. The understory characteristic of this community commonly consists of kinnikinnik, Colorado barberry, and Gambel oak with numerous species of herbs and grasses in the forb layer.

Mixed conifer forests appear at higher elevations in the mountains and consist of trees that are at least five meters (16 feet) tall. Douglas fir, also known as white fir, is the dominant overstory species, although other tree species may also be present in the overstory or mid-story. On north aspects of canyons and on the canyon bottoms above 2104 meters (6900 feet), the mixed conifer forest intergrades with ponderosa pine communities. In flat areas or on eastern exposures, the mixed conifer forest extends to 2591 meters (8500 feet). In protected drainage bottoms and on southern exposures, mixed conifer forests extend to 2744 meters (9000 feet). Some limber pine may be present sporadically. The understory may consist of several shrubs, including ninebark, wild rose, cliff bush, and dwarf juniper with numerous species of herbs and grasses. The average annual precipitation ranges from 51 to 76 centimeters (20 to 30 inches).

There is an obvious relationship between the ecological and topographic characteristics of the area, and these relationships may impact the kinds of species that inhabit various areas of the Laboratory. The following is a sampling of these species. Coyote, rattlesnake, bobcat, gray fox, red-tailed hawk, spiny lizard, mule deer, deer mouse, and desert cottontail are found in the lower elevation zone (1700 to 2000 meters; 5610 to 6600 feet). In the middle elevation zone (2000 to 2400 meters; 6600 to 7920 feet), particularly in the canyons, coyote, raccoon, mountain lion, American black bear, turkey vulture, American kestrel, golden eagle, gopher snake, rock squirrel, and mule deer can be found. In the same elevation zone on the mesa tops are the American black bear, mountain lion, common raven, pygmy nuthatch, Colorado chipmunk, pine squirrel, and mule deer. The upper elevations (2400 to 3200 meters; 7920 to 10,560 feet) are inhabited by the American black bear, mountain lion, green-tailed towhee, hairy woodpecker, Rocky Mountain elk, mule deer, western bluebird, and gray-headed junco.

Section 5. A Brief Summary of Pajarito Plateau Culture History

Occupation and use of the Pajarito Plateau began as early as 10,000 years ago, as foraging groups used the area for gathering and hunting large game animals. The chronology associated with the culture history for the northern Rio Grande was first developed by archaeologists in the 1950s and has been periodically updated and revised since. Table 1 depicts the sequence as currently understood for the central portion of the Pajarito Plateau where LANL is situated. For additional information, see recent studies that examine the prehistory and history of the Pajarito

Plateau, including the wartime and Cold War years of the Laboratory (Vierra and Schmidt 2008, Machen et al. 2011, McGehee et al. 2003a, McGehee et al. 2004, Machen et al. 2010).

Table 1. Culture History Chronology for Northern Rio Grande

Culture	Period	Dates
Paleoindian	Clovis	9500 to 9000 BC
	Folsom	9000 to 8000 BC
	Late Paleoindian	8000 to 5500 BC
Archaic	Jay	5500 to 4800 BC
	Bajada	4800 to 3200 BC
	San Jose	3200 to 1800 BC
	Armijo	1800 to 800 BC
	En Medio	800 BC to AD 400
	Trujillo	AD 400 to 600
Ancestral Pueblo	Early Developmental	AD 600 to 900
	Late Developmental	AD 900 to 1150
	Coalition	AD 1150 to 1325
	Classic	AD 1325 to 1600
Native American, Hispanic, and Euro-American	Early Historic Pajarito Plateau	AD 1600 to 1890
	Homestead	AD 1890 to 1943
Federal Scientific Laboratory	Manhattan Project	AD 1942 to 1946
	Cold War (Early Cold War)	AD 1946 to 1990 (AD 1946–1956)

Paleoindian Period: 9500 BC to 5500 BC

During this early period, small groups of highly mobile Paleoindian hunter-gatherer populations may have followed bison herds up and down the Rio Grande, making frequent trips onto the Pajarito Plateau where they were able to procure obsidian and a variety of subsistence resources. Jemez obsidian has been found at Paleoindian sites in northern Colorado. The period is represented at LANL and elsewhere on the Pajarito Plateau by isolated projectile points.

Archaic Period: 5500 BC to AD 600

Archaic hunter-gatherer groups relied on a wide variety of small game and plant species, while hunting primarily with the spear and atlatl. The piñon-juniper woodlands on LANL land contain evidence of the temporary campsites left behind by these groups as they moved across the landscape (Figure 5.1a). Remains representing these campsites are in the form of lithic scatters (Figure 5.1b), consisting of obsidian tools, chipping debris, and diagnostic projectile points. These sites presumably reflect the seasonal use of upland settings during summer and fall months for pine nut collecting, hunting, and lithic procurement activities. During the last 1500 years of the sequence, cultigens (such as maize) slowly became the dominant food resource.



Figure 5.1a. Artist rendering of Archaic period campsite (Cory Dangerfield)



Figure 5.1b. Archaic period lithic scatter; artifacts are pin flagged.

Developmental Period: AD 600 to 1150

Along the northern Rio Grande, maize horticulturists lived first in semi-subterranean pit structures and then in adobe surface structures. They began to make painted pottery with simple designs and continued to pursue hunting and gathering, relying on the bow and arrow. Most habitation sites dating to this time period are located at lower elevations near the Rio Grande, and the Pajarito Plateau presumably was used on a seasonal basis. However, hunter-gatherer groups may have also continued to use these upland resource areas. The general lack of recorded Developmental period sites at LANL and elsewhere on the Pajarito Plateau may be indicative of a depopulation of the Plateau at this time. The Developmental period is generally thought by archaeologists to represent the earliest demonstrable link with modern Pueblo populations. This begins what used to be called the Anasazi culture but is more properly termed Ancestral Pueblo culture.

Coalition Period: AD 1150 to 1325

During the Coalition period there was a substantial increase in the number, size, and distribution of aboveground habitation sites, with year-round settlements expanding into upland areas throughout the Pajarito Plateau. A long-term process of site aggregation begins at this time, with early sites containing adobe and masonry rectangular structures with 10 to 20 rooms (Figures 5.2a and 5.2b). The remains of these sites are present in the hundreds of small mounds of shaped tuff blocks and dense artifact scatters commonly found throughout LANL. In contrast, later sites of this period consist of large masonry plaza pueblos that contain more than 100 rooms. Thirty-one of these large plaza pueblos have been identified at LANL. The construction of agricultural features associated with these sites, including terraces, gravel mulch gardens, and dams, suggests an even greater reliance on horticulture than previously evidenced in the region. Cavate structures, rooms dug into the compacted volcanic tuff cliffs, likely make their first appearance on the Plateau towards the end of the Coalition period. The increase in Coalition-period site density is attributed both to population migration and local population growth.

Classic Period: AD 1325 to 1600

The Classic period is characterized by intensive maize agriculture. Ancestral Pueblo settlements on the Pajarito Plateau became increasingly aggregated into three large population clusters with sizeable numbers of associated outlying fieldhouses and farmsteads. The central site cluster consists of four temporally overlapping sites: Tsankawi (Bandelier National Monument), Tsirege (LANL), Navawi (Pueblo de San Ildefonso), and Otowi pueblo (Pueblo de San Ildefonso). The initial occupation of these four pueblos may have occurred during the 14th century with Navawi and Otowi, continuing with Tsirege and Tsankawi into the early portion of the 16th century. Oral traditions from the contemporary Pueblo de San Ildefonso indicate that Tsankawi was the last of the Pajarito Plateau pueblos to be abandoned. This central group of four Classic period communities is ancestral to the Tewa speakers of the Pueblo de San Ildefonso. Tsirege, one of the largest of the Classic period pueblos, is also noted for its associated impressive cavate structures and rock art images (see Section 15).



Figure 5.2a. Excavated Coalition period habitation site

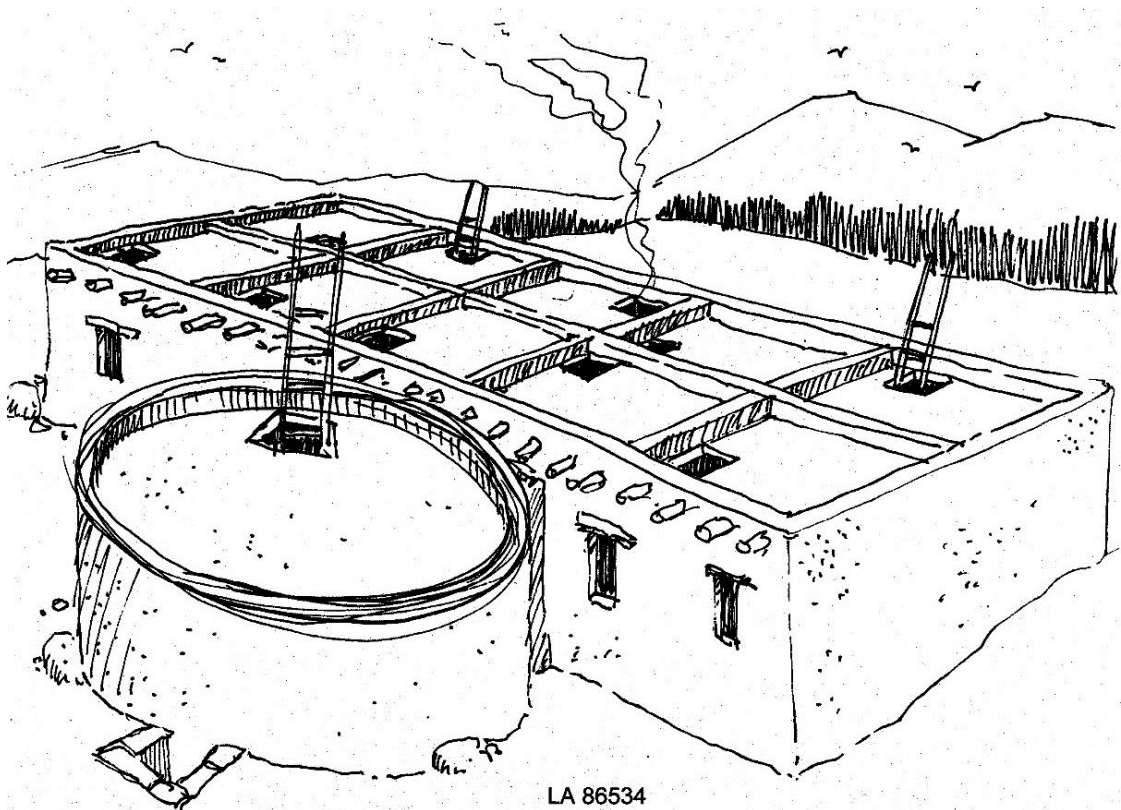


Figure 5.2b. Artist reconstruction of site depicted in Figure 5.2a (Dave Brewer)

Early Historic Pajarito Plateau Period: AD 1600 to 1890

Because of a series of droughts, the Pajarito Plateau was eventually abandoned as a year-round residential area during the mid-1500s. At this time, new pueblos were constructed and occupied along the Rio Grande Valley. Although the historic period in northern New Mexico begins with Coronado's exploratory expedition up the Rio Grande from 1540 to 1542, most researchers date the period beginning in AD 1600. This date corresponds with Juan de Oñate's settlement in New Mexico and imposition of the Spanish land grant ranch system into Rio Grande communities. In 1680, the Pueblo Indians revolted against the Spanish. At this time, several Ancestral Pueblo sites situated on the topographically isolated and elevated Pajarito Plateau (including LANL) were reoccupied, as they offered natural protection and defense for groups of refugees. With the conquest and resettlement of this area by de Vargas (1693 to 1696), the economic and settlement systems of the pueblos were completely overhauled and revamped. The large mission communities, characteristic of the earlier period, disappeared, as did the large ranches. Instead, lands were granted to dozens of Hispanic families and other individuals who had worked the lands during previous years. Only one site dating to this period, a Pueblo revolt refuge in a late Coalition-period plaza pueblo, has thus far been identified at LANL.

Athabaskan groups from northern and western areas have occupied or used portions of northwestern New Mexico since the 15th century (Figure 5.3a); however, evidence for Navajos and Jicarilla Apaches in the northern Rio Grande begins with the Spanish Colonial period. The Navajo and Jicarilla made periodic visits to the Rio Grande Valley and Jemez Mountains for seasonal hunting and gathering trips, with the Navajo also conducting periodic raiding of the Pueblos. The only definable Athabaskan archaeological sites at LANL, a few stone tipi rings in Rendija Canyon (Figure 5.3b), appear to relate to the Jicarilla and date to the last half of the 19th century.

Mexico declared independence from Spain in 1821, which brought about a more lenient land grant policy and an expansion of existing trade networks. Trade between Missouri and Santa Fe along the Santa Fe Trail began soon after independence and dominated many of the events in the area for the next quarter-century. Increased trade brought many comparatively inexpensive Euro-American goods into the northern Rio Grande region, a fact that is reflected in the increase of manufactured items identified at sites dating to this period. No sites that date specifically to this period have been identified at LANL.

The lands that eventually came to be New Mexico remained a part of Mexico until the United States–Mexican war began in the mid-1800s. Troops led by Colonel Stephen W. Kearny raised the American flag in Santa Fe and took possession of these lands for the United States on August 18, 1846. Grazing and seasonal use of the Pajarito Plateau by non-Indians were common during the early Historic period, and the first homesteads were established on the Plateau during the early 1880s. New Mexico was provided with a territorial government in 1850, and it remained a territory until being granted statehood in 1912.



Figure 5.3a. Athabaskan campsite



Figure 5.3b. Tipi ring suggesting Athabaskan occupation

Homestead Period: AD 1890 to 1943

During the early 1900s, New Mexico saw a continuation of traditional farming strategies, cattle grazing, timbering, and a wide variety of cultural practices. However, large-scale sheepherding, timber, and mining activities during this period displaced some Hispanic communities. Seasonal homesteading continued to be prevalent on the Plateau. Wooden cabins, corral structures, and rock or concrete cisterns characterize Hispanic and Anglo Homestead era sites (Figure 5.4a). Many of the wooden structures burned during the May 2000 Cerro Grande fire (Figure 5.4b) (Nisengard et al. 2002). Artifact scatters, consisting of historic debris associated with household and farming/grazing activities, are also commonly found at this time period. Much of the evidence for homesteading at LANL dates between 1912 and 1943, likely a reflection of changes relating to both the Enlarged Homestead Act of 1909 and the Grazing Homestead Act of 1916. The period of 1890 to 1943 is typically referred to as the Homestead period at LANL. Most of the central Pajarito Plateau homestead patents were filed by Hispanic peoples who maintained permanent homes in the Rio Grande Valley, using the Pajarito Plateau sites for seasonal farming and resource gathering. Notable exceptions to this pattern included the establishment of a few permanent Anglo commercial concerns such as the Anchor Ranch and the creation of the Los Alamos Ranch School, the latter of which was in operation from 1918 until the late spring of 1943. The end of the Homestead period coincides with the appropriation of lands on the Pajarito Plateau for the Manhattan Project in 1942–1943 (Machen et al. 2011).



Figure 5.4a. Homestead era habitation on LANL land



Figure 5.4b. Homestead depicted in Figure 5.4a after the Cerro Grande fire

Manhattan Project Period: AD 1942 to 1946

In 1942, Franklin D. Roosevelt gave his approval for the development of the world's first atomic bomb. The geographic and topographic isolation of the Pajarito Plateau that had been a benefit to Ancestral Pueblo peoples during the Pueblo Revolt was attractive to project developers, and Los Alamos, New Mexico, was selected as the site for design and construction of the atomic bomb. Manhattan Project (code-named Project Y) activities at Los Alamos officially began with the closure of the Los Alamos Ranch School after the end of the graduating class of 1943, which had an accelerated graduation in February. At the same time, additional lands were secured from government agencies, such as the Forest Service, and from the predominantly Hispanic homesteaders. Construction of Project Y began at the Los Alamos site in 1943 (Figure 5.5). The atomic age was ushered in with the detonation of the first atomic device at the Trinity test site in southern New Mexico on July 16, 1945. The detonation of the Los Alamos Little Boy design rapidly followed. On August 6, 1945, this device was detonated over the Japanese city of Hiroshima. The subsequent detonation of the Fat Man device over Nagasaki on August 9, 1945, led to the official surrender of Japan on August 14, 1945. During the period between the surrender of Japan and the middle of 1946, Project Y was downsized, with many Los Alamos scientists returning to their pre-Manhattan Project academic jobs. The primary mission of the Laboratory at that point became that of stockpiling and developing additional atomic weapons. The Manhattan Project officially came to an end at Los Alamos with the beginning of the atmospheric testing program in the Pacific and the development of the civilian United States Atomic Energy Commission (AEC). The AEC officially took over the operation of the

Los Alamos site in 1947. Under the 2014 NDAA legislation, 17 Manhattan Project-period buildings in 8 technical areas have been selected for inclusion in the Manhattan Project National Historical Park.



Figure 5.5. Remains of wooden protective cover used to shelter Manhattan Project bomb casings at the end of World War II

Cold War Period: AD 1946 to 1990

The Cold War lasted from 1946 until approximately 1990. At LANL, the Cold War can be divided into at least two components: an early Cold War period lasting between 1946 and 1956, and the Late Cold War from 1957 until 1990. Many of the Cold War period buildings are now over 50 years old. LANL is identifying Cold War-era historic districts.

Early Cold War: 1946 to 1956

The future of the early Laboratory was in question after the end of World War II (WWII). Many scientists and site workers left Los Alamos and went back to their pre-war lives. Norris Bradbury was appointed director of the Laboratory following J. Robert Oppenheimer's return to his pre-WWII duties. Bradbury felt that the nation needed "a laboratory for research into military applications of nuclear energy" (LANL 1993). In late 1945, General Groves directed Los Alamos to begin stockpiling and developing additional atomic weapons (Gosling 2001). Post-war weapon assembly work was now tasked to Los Alamos's Z Division, which had been relocated to an airbase (now Sandia National Laboratories) in nearby Albuquerque, New Mexico (Gosling 2001).

In 1946, Los Alamos became involved in Operation Crossroads, the first of many atmospheric tests in the Pacific. Later, also in 1946, the AEC was established to act as a civilian steward for the new atomic technology born of WWII. The AEC formally took over the Laboratory in 1947, making a commitment to retain Los Alamos as a permanent weapons facility.

With the beginning of the Cold War—the term Cold War was first coined in 1947—weapons research once again became a national priority. Weapons research at Los Alamos was spearheaded by Edward Teller and Stanislaw Ulam and focused on the development of the hydrogen bomb, the feasibility of which had been discussed seriously at Los Alamos as early as 1946. The simmering Cold War came to a full boil in late 1949 with the successful test of Joe I, the Soviet Union's first atomic bomb. In January 1950, President Truman approved the development of the hydrogen bomb. Truman's decision led to the remobilization of the country's weapons laboratories and production plants. The year 1950 also marked the initial meeting of Los Alamos's Family Committee—a committee tasked with developing the first two thermonuclear devices (LANL 2001). In 1951, the Nevada Proving Ground was established and the first Nevada atmospheric test, Able, was conducted. In the same year, Los Alamos directed Operation Greenhouse in the Pacific and successfully conducted both the first thermonuclear test, George, and the first thermonuclear boosted test, Item. In 1952, the first thermonuclear bomb, known as Mike, was detonated at Enewetak Atoll in the Pacific (LANL 1993). The Soviet Union responded with a successful fusion demonstration in August 1953, followed by a test of a hydrogen bomb in 1955. The arms race was on. By 1956, Los Alamos had successfully tested a new generation of high explosives (HE, specifically plastic-bonded explosives) and had begun to make improvements to the primary stage of a nuclear weapon (LANL 2001).

Although weapons research and development has always played a major role in the history of LANL, other key themes for the years 1942–1956 include supercomputing advancements, fundamental biomedical and health physics research, HE research and development, reactor research and development, pioneering physics research, and the development of the field of high-speed photography (McGehee and Garcia 1999). The early Cold War era at Los Alamos ended in 1956, a date that marks the completion of all basic nuclear weapons design at LANL. Later research at Los Alamos focused on the engineering of nuclear weapons to fit specific delivery systems. The year 1956 was also the last year that Los Alamos was a closed facility—the gates into the Los Alamos townsite came down in 1957.

Late Cold War (1956–1990)

The late Cold War era saw the Laboratory's continued support of the atmospheric testing programs in the Pacific and at the Nevada Test Site. In 1957, the first of many underground tests in Nevada was conducted, and in 1963, the Limited Test Ban Treaty was signed, which banned atmospheric testing and also nuclear weapons tests in the oceans and space (DOE 2000a). Defense mission undertakings during this time included treaty and test-ban verification programs (such as the satellite detection of nuclear explosions), research and development of space-based weapons, and continued involvement with stockpile stewardship issues. Nonweapons undertakings supported nuclear medicine, genetic studies, National Aeronautics and Space Administration collaborations, superconducting research, contained fusion reaction research, and other types of energy research (McGehee and Garcia 1999, Garcia et. al 2015a, and Garcia et. al 2015b).

The Cold War Ends

The Cold War ended in the early 1990s. Its demise was marked by the Strategic Arms Reduction Treaty (START, signed by President George H. W. Bush and Soviet President Mikhail Gorbachev), and by President Bush's announcement in September 1991 of a unilateral decision to decrease significantly the U.S. nuclear weapon stockpile. That announcement was followed in June 1992 by an agreement between President Bush and Russian president Boris Yeltsin to reduce each country's nuclear arsenal gradually over the next decade. The arms race that had lasted nearly half a century was over (Machen et al. 2010).

Notable Historic Resources in the Vicinity of LANL

Neighboring Bandelier National Monument was established in 1916 in recognition of its outstanding Ancestral Pueblo archaeological resources. Three other sets of resources in the vicinity of LANL have been established as NHL Districts: The CCC (Civilian Conservation Corps) Historic District on Bandelier National Monument (established in 1987); Puye Ruins on the Santa Clara Indian Reservation (1966); and the Los Alamos Scientific Laboratory (1965). The latter is the location of former Technical Area (TA) 1 in downtown Los Alamos, which includes Fuller Lodge, the Bathtub Row Houses, and the Ice House Monument at Ashley Pond. Additional resources of note in the County of Los Alamos listed in the Register include the Guaje Site (1982) and Chupaderos Mesa Village (1990), both large Ancestral Pueblo villages, and the Chupaderos Canyon Small Structural Site (1990) and Guaje Water/Soil Control Site (1990), all on Santa Fe National Forest lands; the White Rock Canyon Archaeological District (1990, 1992); Pajarito Springs Site (1982); and two historic wagon roads, Bayo Road (2003) and Grant Road (2004). In 2003, 10 roads and trails, termed Homestead Era Roads and Trails of Los Alamos, New Mexico, were placed in the State Register of Cultural Properties. The Pond Cabin at LANL's TA-18, built circa 1914, was listed in the New Mexico Register in 1989, and several prehistoric sites located in Rendija Canyon were listed as a TCP district in 2008. Although the land containing the Rendija TCP district will be conveyed to the County of Los Alamos, a 2010 MOA between DOE/NNSA, Los Alamos Field Office, the Incorporated County of Los Alamos, and the New Mexico State SHPO provides access to the area for members of the Pueblo de San Ildefonso and Santa Clara Pueblo.

In December 2014, the enactment of the NDAA established the Valles Caldera (Caldera) National Preserve as a unit of the National Park system. The Caldera is located in the neighboring Jemez Mountains located west of LANL. Cultural resources at the Caldera consist primarily of large and small obsidian reduction areas, but the area is renowned for its large obsidian quarries. Most obsidian found within LANL archaeological sites can be sourced to the Jemez Mountains in and around the Caldera.

The December 2014 legislation contains a provision that creates the Manhattan Project National Historical Park. Seventeen Manhattan Project-era properties at LANL were identified for inclusion in the Manhattan Project National Historical Park. On November 10, 2015, the MOU between the Secretaries of Interior and Energy was signed.

Section 6. Numbers and Types of Historic Properties at LANL

As noted in the glossary, the term archaeological applies to any location exhibiting the traces of past human activity that can yield information through use of archaeological methods and principles. Homestead sites and features are included in the category of archaeological resources, along with trash deposits dating to the Manhattan Project and Cold War—however, more recent historic buildings and structures are excluded from consideration as archaeological resources. As of January 2015, 1880 archaeological sites have been recorded at LANL. These are roughly divided into prehistoric resources and historic resources. Prehistoric archaeological sites at LANL refer to locations containing items used or modified by people, or other physical evidence of the use of people, before the establishment of a European presence in the upper Rio Grande Valley in the middle of the 16th century. Historic archaeological sites at LANL include any archaeological resources dating after that date through the Homestead period, including trash scatters and other nonstructural remains dating to the Manhattan Project and the Cold War.

As of January 2015, intense archaeological surveys have been conducted on approximately 90 percent of LANL land in compliance with federal standards for complete survey coverage. Currently, 1738 prehistoric archaeological sites have been recorded at LANL, most of which date to the 13th through 15th centuries. About 670 of these prehistoric sites have been assessed by for eligibility for inclusion in the Register. Of these, 428 were determined eligible, 82 ineligible, and 156 undetermined. The remaining 1072 sites have not yet been assessed for Register eligibility and are treated as eligible until assessed otherwise.

Concerning historic archaeological sites, 142 have been recorded at LANL, the majority of which (117 sites) are structures or artifact scatters associated with the early Historic or Homestead periods. The remaining 25 sites are experimental areas and artifact scatters dating from the Manhattan Project and Cold War periods. Of these 142 sites, 29 have been determined eligible for inclusion in the Register.

Concerning the historic built environment (Manhattan Project and more recent), 419 buildings and structures date to the Manhattan Project and early Cold War. Of these, 20 date to the Manhattan Project. Of the 419 buildings and structures, 308 have been evaluated for eligibility for inclusion in the Register. Of these 308 buildings and structures, 153 are eligible and 155 are not eligible. These figures include a small number of properties younger than 50 years in age that are deemed of exceptional significance and are thus eligible for inclusion in the Register despite not yet having achieved the 50-year age limit normally required for inclusion in the Register. The *2008 Site-wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory* (SWEIS) (DOE 2008) identified some of these potentially exceptional properties as the 15 SWEIS “key facilities.”

The following is a classification and brief description of the types of archaeological sites or features within sites and historic building and structure categories known to be present at LANL. Archaeological site types are defined on the basis of their size, morphological characteristics of associated features, and the nature of the associated artifact assemblages.

Administration building: A category of historic building that includes office buildings and facilities housing cafeterias and health and safety offices (the latter being change rooms and offices for monitoring staff).

Bedrock/boulder features: Cultural features excavated into bedrock or boulders that are not cavates or game pits. Examples include grinding slicks, mortars, water-channeling grooves, and isolated hole(s) in horizontal rock surfaces. Grinding slicks, the most common bedrock feature, are concave depressions created by the sharpening of stone axes, the pulverizing and grinding of plants, or other activities.

Cavate: A room carved into a cliff face within the Bandelier Tuff geological formation. The category includes isolated cavates, multiroom contiguous cavates, and groups of adjacent cavates that together form a cluster or complex.

Game pit: A cavity dug down into the tuff bedrock presumed to have been used as a passive hunting drop site for larger game animals (e.g., deer) or as concealment from which to lure and trap birds.

Garden plots: Small, formal agricultural areas, often bounded with cobbles and containing gravel mulch (e.g., grid gardens and/or terraces). This site category typically consists of square-to rectangular-shaped rock alignments, with individual units being more than 3 meters in length (in contrast with one- to three-room structures, defined below).

Historic artifact scatter / trash scatter: A concentration of items, including Euro-American artifacts, produced and deposited after AD 1600 (but most typically in the Los Alamos area deposited after about AD 1890).

Historic infrastructure: The basic physical and organizational structures and installations needed to support a community, such as transportation systems, water supply, sewers, electrical grids, telecommunications, etc. LANL examples include historic water catchment devices (reservoirs, stock ponds, and cisterns), fence lines, and telephone lines. Roads, trails, and corrals (rock/wood enclosure) are not included, as they are listed as separate site types. Note this is an archaeological site category not to be confused with support buildings and structures, a site type, which is a historic building category.

Historic structure: A building or other structure constructed after AD 1890, including both homestead structures and Laboratory-era buildings and structures that have been evaluated for Register eligibility.

Inscriptions and dendroglyphs: Historic designs, letters, numbers, or symbols scratched, pecked, scraped, or carved in stone or tree bark.

Isolated object or occurrence: Individual artifacts (such as a projectile point) or small clusters of a single type of prehistoric and historic artifact (e.g., pottery sherds from the same vessel; related chippings from the manufacture of a chipped stone tool), found outside the boundaries of a defined archaeological site. While such items are treated differently than those from defined archaeological sites for management purposes, they can nevertheless inform on past human behaviors and occupations at LANL.

Kiva: An Ancestral Pueblo ceremonial room, typically circular in shape and partially or fully underground, in some cases being excavated deeply into bedrock. Most kivas are associated with habitation sites, but some can be found in isolation. “Cave kiva” is a term sometimes used for

unusually large cavate rooms exhibiting a square shape, substantial plaster, and other features such as petroglyph panels and floor loom holes.

Laboratory-processing building: A category of historic building in which laboratory and/or processing activities were conducted. This category includes scientific research laboratories or facilities that processed chemicals or other experimental materials (such as HE, tritium, plutonium, metals, alloys, etc.).

Lithic scatter: Clusters of chipped stone tools, ground stone tools, and/or pieces of chipped stone produced during the manufacturing of chipped stone tools.

Lithic and ceramic scatter: A combination of ceramic sherds, chipped stone, and/or ground stone artifacts, which lack identifiable surface structural remains or evidence of pit structures.

One- to three-room structures: The remains of a small surface structure constructed of adobe, jacal (thatch), or masonry. This site typically consists of square- to rectangular-shaped rock alignments, with individual units being no more than 3 meters in length. The majority of these sites are identical to what many researchers term fieldhouses and farmsteads. Also included in the one- to three-room structure category are examples of unusually large rectangular structures, along with several rather small structures, which are unusual because of the presence of upright stones or because of location, such as at the eastern tips of mesas. Some of these unusual structures may represent shrines or have been used for purposes not directly related to agriculture.

Pit structure: Presumed habitation sites with evidence (e.g., depressions) of one or more structures built entirely or partially underground.

Plaza or complex pueblo: Contains one pueblo roomblock that partially encloses (on three sides) or completely encloses a plaza and/or contains two or more roomblocks located close together (less than 200 meters apart). Plaza pueblos typically are much larger (in both room numbers and site size) than single pueblo roomblock sites, often representing structures originally two or three stories in height.

Pueblo roomblock: The remains of a contiguous, multiroom habitation structure (four or more rooms with no enclosed plaza) constructed of adobe, jacal, or masonry. Somewhat amorphous mounds contain evidence of stone rubble (rubble mounds).

Rock art: This category includes several subtypes including petroglyphs, pictographs, and rock art panels. A petroglyph consists of a design or set of symbols scratched, pecked, or scraped into a rock or plastered surface, which are distinguished from historic and modern graffiti. A pictograph consists of a design or set of symbols painted rather than pecked, scratched, or scraped. A rock art panel consists of series of petroglyphs (and, rarely, pictographs inside rock shelters and cavates) grouped together on a cliff face or boulder.

Rock/wood enclosure: A small area enclosed by loosely stacked rock or log alignments (e.g., corral or lambing pen). These are distinguished from one- to three-room structures by the nature of the stacking methods and often by the presence of historic artifacts in and around the enclosure.

Rock feature: Typically isolated examples of rock piles, amorphous rock concentrations, and/or upright stones. The latter sometimes are in the shape of a ring several meters in diameter and are often referred to as rock rings. Some rock features may be what researchers refer to as shrines and boundary markers.

Rock ring: A circular arrangement of rocks. Some of these represent the residue from a dismantled tipi or wikiup. Another category of rock rings includes circular arrangements of shaped or unshaped tuff blocks, sometimes with upright shaped stones, which may represent Ancestral Pueblo shrines.

Rock shelter: An overhang, indentation, or alcove formed naturally in a rock face or large boulder, or alternatively, a partly enclosed area created by rock falls leaning against a rock face or large boulder, and which exhibits evidence of human use. Rock shelters generally are not of great depth, in contrast to caves.

Security buildings and structures: A category of historic buildings and structures that includes guard stations, security lights, and fencing.

Stairway: A set of two or more steps carved into a steep section of tuff bedrock, typically associated with trails or access to cavates.

Support buildings and structures: A category of historic buildings and structures that includes warehouses, water tanks, utilities, and waste-treatment facilities.

Talus house: The remains of a one- to three-room structure located adjacent to a canyon cliff face. Typically, talus houses are built in front of cavates and are included as an associated feature under the cavate site type. Under this site type, the talus room is not associated with a cavate.

Thermal features: Heating or cooking features indicated by concentrations of ash and/or charcoal (with or without burned rock) that indicate a hearth, or rock concentrations that are thermally discolored and/or broken into debris (fire-cracked) that indicate a roasting pit or hearth.

Trail: Prehistoric or historic path defined by use-wear or cutting into bedrock or soil surfaces, along with any revetments, embankments, or other structural components of the trail.

Road: A formal route used for the passage of vehicles, along with revetments, embankments, or other structural components of the road. Roads that exhibit rutted tracks in bedrock formed as a result of historic wagon use form the majority of sites in this category.

Water-control feature: A device (e.g., a stone check-dam) that controls the flow of water, particularly runoff.

Section 7. DOE Land Conveyance and Transfer Project

A major archaeological data recovery project was conducted at LANL between 2002 and 2006 as part of the DOE Land Conveyance and Transfer Project, which is detailed in the voluminous project report (Vierra and Schmidt 2008). This project produced an invaluable management baseline of archaeological data and yielded data used in part for Ph.D. dissertations, several journal articles, and book chapters as noted below.

On November 26, 1997, Congress passed Public Law 105-119. Section 632 of that law directed the Secretary of Energy to convey tracts of land to the County of Los Alamos, New Mexico, and the Pueblo de San Ildefonso through the Department of Interior. To be considered eligible, tracts of land (1) had to be no longer needed by DOE for the national security mission, (2) could be restored or remediated by November 26, 2007, and (3) would be suitable for historic, cultural, or environmental preservation; economic diversification; or community self-sufficiency. In January 2011, an Amended Record of Decision, Federal Register Vol. 77, No. 14, "Transfer of Land Tracts Located at Los Alamos National Laboratory, New Mexico," was issued, extending the public law to 2022.

In response to this Public Law, the DOE identified 10 tracts of land (1942 hectares; 4796 acres), with portions of 3 being designated for transfer to the Pueblo de San Ildefonso and the remainder being designated for conveyance to the County of Los Alamos. A combination of existing and new archaeological surveys documented 213 archaeological sites, of which 180 were eligible or had an undetermined eligibility for inclusion in the Register. Land transferred to the Department of the Interior to hold in trust for the Pueblo de San Ildefonso is not an "undertaking" under the NHPA; therefore, no further compliance was required. However, under 36 CFR 800.5(vii), the conveyance of lands to the County of Los Alamos is considered an adverse effect to historic properties, unless adequate and legally enforceable restrictions to ensure the long-term preservation of these properties' historic significance are met.

The County of Los Alamos expressed its intention to develop the conveyed land, although three parcels within these tracts were identified for preservation. A data recovery strategy plan was developed, and approved by the SHPO, for the remaining lands designated for conveyance to the County of Los Alamos, and a programmatic agreement was entered into by the DOE, ACHP, SHPO, and the County of Los Alamos to implement the approved data recovery program. As a result, excavations were conducted in the Rendija Tract north of the Los Alamos townsite, the Airport Tract immediately south and east of the Los Alamos airport, and the White Rock Tract west of the White Rock townsite (see Figure 1.1 for the approximate locations of these tracts).

The 4-year data recovery program resulted in the excavation of 39 sites and the collection of approximately 150,000 artifacts. Limited site eligibility testing was also conducted at nine archaeological sites. The excavations included 2 Archaic lithic scatters; 3 Coalition-period roomblock habitation sites, one of which also had extensive Archaic lithic materials and a grid garden in the vicinity; 25 Coalition- to Classic-period 1- to 3-room structures (which have been identified as fieldhouses based on the excavation data); 2 sets of Classic-period grid gardens; 4 multicomponent lithic and ceramic scatters; 2 late 19th century Apache tipi ring sites; and a historic homestead. These sites and other significant aspects of the associated assemblages are briefly highlighted below.

LC&T Excavations

The four Archaic-period sites or site components were situated in secondary contexts and lacked in situ features and structural integrity. One site dated to the Early Archaic, another to the Late Archaic, and the remaining two to the Middle- to Late Archaic. The lithic assemblages associated with these sites were dominated by the production and maintenance of bifacial tools, with a change in projectile point technology from Early- to Late Archaic. The site locations and associated lithic assemblages when viewed with other regional site information suggest a Late-Archaic lowland/upland land-use pattern within portions of the Rio Grande Valley (Vierra and Ford 2006, Vierra and Ford 2007, Vierra 2008). This land-use pattern would have involved population groups moving from the juniper-savanna vegetation zone in the early summer to the ponderosa pine / mixed conifer zone in the mid- to late summer and then back down to the piñon-juniper woodlands in the fall. The analysis of lithic debitage assemblages from a sample of sites distributed throughout these vegetation zones indicates that they are all linked by reduction tactic and obsidian procurement patterns. Lowland habitation sites are characterized by an emphasis on core reduction, while upland campsites are characterized by biface production.

The three Coalition-period roomblock sites (two in the Airport Tract and one in the White Rock Tract) consisted of two contiguous linear sets of rooms with varied floor plans and architectural construction styles. Habitation rooms are typically located along the eastern side of the pueblo, while storage rooms are located along the west side. Habitation rooms are generally larger than storage rooms and often contain hearths (Figure 7.1). One site contained an attached semi-subterranean circular kiva chamber excavated into the tuff bedrock (Figures 5.2a, 5.2b). The other two sites did not contain a kiva and tended to have larger habitation and storage rooms. Analyses of macrobotanical remains suggest an emphasis on agricultural activities at these roomblock sites. A general lack of structural remodeling at these three habitation sites indicates that they were occupied for 10 to 15 years and then abandoned once the local resources were exhausted. One site exhibited a late occupation consisting of a linear row of more than ten rooms partly superimposed over an earlier more typically configured roomblock. The lack of prepared floors and floor features suggests that this long linear row of rooms was abandoned during construction.

Twenty-five Coalition- and Classic-period fieldhouses were excavated, with twenty-one of them located in the DOE Rendija Tract, immediately north of the Los Alamos townsite (Figure 1.1). The Rendija Tract sample in particular represents one of the largest comprehensive data sets on Coalition- and Classic-period fieldhouses from a single circumscribed environmental zone (the transition between the upper piñon-juniper woodland and the lower ponderosa pine forest) along the northern Rio Grande (Lockard 2009, Adams 2011). Twenty of the Rendija Tract fieldhouses consisted of a single room, and one contained two rooms. From an architectural perspective, there are at least four defined types of fieldhouses. These include thirteen 1-room rectangular structures without internal hearths (Figure 7.2), five 1-room rectangular structures with internal hearths, a 2-room structure consisting of a larger rectangular room with a hearth and an attached smaller trapezoidal room with a hearth (Figure 7.3), a circular structure without a hearth, and a structure of undetermined architectural style. The estimated average wall height for the rectangular structures is 1.17 meters (Figure 7.4). One of the rectangular fieldhouses has a unique slab step entryway (Figure 7.2).



Figure 7.1. Coalition-period pueblo roomblock, looking north



Figure 7.2. Rendija Tract fieldhouse with possible step entryway



Figure 7.3. Rendija Tract fieldhouse with two rooms, both containing hearths



Figure 7.4. Rendija Tract fieldhouse with partially intact standing walls

The number of artifacts recovered from the fieldhouses ranged from 9 to 772, with an average of 253. Artifact and sample analysis, however, indicated that despite architectural variability, fieldhouses were not functionally differentiated; the structures with hearths and perhaps those with larger interior space were possibly more intensively occupied or used for a longer period of time. Pollen and botanical remains indicated that most of the structures were associated with agricultural activities, and more than half were associated with wild plant gathering activities as well. In terms of cultigens, maize macrobotanical remains were found at 12 of the Rendija Tract fieldhouses, with maize pollen being found in the vicinity of 4 additional fieldhouses. Cholla was found at three fieldhouses, squash at two fieldhouses, and beans were recovered from a single fieldhouse. Very few faunal remains or projectile points were found in association with the fieldhouses.

Three sets of Classic-period grid gardens were excavated that varied greatly in construction, layout, and orientation. The one aspect that they had in common was an apparent cultural modification of the interior soil, with the grids having been filled with a more arable, unconsolidated, silty loam. Very few macrobotanical remains were recovered, with most botanical evidence being derived from pollen. Maize was present in 45 percent of the 69 pollen samples obtained from the grid gardens, with cotton pollen being present at 2 of the site locations, along with a single instance of squash pollen from an apparent post-occupation stratum at one grid-garden site.

Four multicomponent lithic and ceramic scatters were excavated in the White Rock Tract and the Airport Tract, each with potential Archaic- and Ceramic-period components. The two White Rock Tract sites were situated in a secondary context and lacked structural integrity, and the two Airport Tract sites lacked detailed site-structure information.

Two of the excavated sites in the Rendija Tract were Jicarilla Apache tipi ring sites that were likely occupied around the turn of the 20th century. One site contained a single rock ring, and the other contained two rock rings (Figure 5.3b). Both sites contained small charcoal concentrations that indicate the presence of a warming hearth. The limited botanical remains recovered from the sites could indicate a late-summer or early-fall occupation, with the warming hearths suggesting the cooler fall occupation. Recovered artifacts included glass seed beads; metal cans, bullets, bridle parts, and cone tinklers; ground stone; chipped stone tools and debitage; and Jicarilla Apache ceramics.

The final excavated site is the Serna Homestead in the Rendija Tract. Excavation revealed several distinct features including the main cabin (Figure 7.5), the horno, the shed, the corral, and the reservoir. Wood samples from the site were collected and submitted for tree-ring analysis. Data results indicate that the cabin was constructed around AD 1900. Oral historical descriptions of the cabin indicate that it contained three rooms and a sun porch. These observations could not be supported nor refuted by excavation data; however the artifact assemblage does support the homestead's seasonal use. Domestic artifacts composed the majority of the artifact assemblage. With the possible exception of a shovel blade, no agricultural implements were recovered from the site. Several large pieces of sheet metal with multiple holes punched in them may have been used to wash or clean harvested beans.



Figure 7.5. Serna Homestead main cabin

Site Material Culture, Settlement Patterns, Baseline Studies, and Specialized Studies

In addition to the findings noted above, the DOE LC&T Project excavations provided the opportunity to perform a number of baseline and specialized studies contributing to the understanding and management of LANL historic properties¹. One such set of studies is the detailed examination of Coalition- and Classic-period ceramics (for example, Curewitz 2008). Ceramic analysis indicates that Santa Fe black-on-white pottery, which is dominated by bowl vessel forms, does not appear to exhibit significant stylistic changes during the Coalition period. Changes in temper and paste appear to be more sensitive than stylistic changes for distinguishing earlier versus later varieties of Santa Fe black-on-white. Anthill sand temper seems to be more prevalent in the earlier varieties of Santa Fe black-on-white, while tuff is more prevalent in the later varieties.

Nonlocal ceramics are very rare at Coalition-period sites. Ceramic evidence for regional interactions increases significantly from the Coalition period to the Classic period. There is a perceived increase in the trade relationships between the occupants of the Pajarito Plateau and

¹ Volume 1 of The Land Conveyance and Transfer Data Recovery Project (LA-UR-07-6205) contains baseline studies focusing on land use, geology, geomorphology, ecology, paleoenvironments, pollen, dendrochronology, dendroclimatology, obsidian deposition, and archaeomagnetic, obsidian hydration, and luminescence dating. Volume 4 contains specialized studies focusing on Archaic land use and material culture, Pajarito Plateau Coalition and Classic period ceramics, settlement and subsistence, trails and rock art, and wildfire effects.

their Tewa neighbors in the Rio Grande Valley, which is supported by the presence of Sapawe micaceous ceramics at Classic-period fieldhouses.

During the Classic period, research suggests that inhabitants became more specialized in craft production. Evidence of specialization is found in the presence of large jars, which require a higher level of manufacturing skill and the shift from sand temper of the Santa Fe black-on-white ceramics to the tuff temper of the Classic-period biscuitwares. Craft specialization during this period suggests that fewer potters were building vessels, resulting in a more standardized size and controlled selection of materials and production technology.

The DOE LC&T Project excavations contributed data to studies of settlement patterns (immigration, reorganization, and population coalescence) and traditional cosmology during the Coalition and Classic periods (Duwe 2011). The artifacts collected from these excavations will undoubtedly continue to be valuable resources for future research.

In addition to the detailed site and artifact descriptions, the excavation report presents an extensive amount of synthesized baseline data on the geology, geomorphology, environment, general dating techniques, Archaic-period land use, ceramic type and attribute analyses, settlement change and demography, Ancestral Pueblo trail use, and rock art applicable to the Pajarito Plateau.

Geomorphological studies are of particular importance for evaluations of site integrity and site significance for certain types of archaeological sites such as fieldhouses and artifact scatters (Appendix B). The LC&T Project archaeological sites were situated on mesa-top, colluvial-slope, fluvial-terrace, valley-bottom, and ridge-top settings. Geomorphic studies indicated that a post-Pueblo eolian deposit is present on many of the Pajarito Plateau mesa tops. Eolian deposition of from 15 to 20 centimeters is inferred to have occurred sometime after the Middle Coalition period but before the Classic period (circa AD 1250–1325), and in many cases Coalition- and Classic-period sites can be differentiated based on stratigraphic relationships. A second, more recent eolian event resulted in deposition of an additional 5 to 10 centimeters of fine-grained sediment in mesa-top settings since approximately AD 1500. With this deposition, Ancestral Pueblo sites will typically be buried and generally in good archaeological context. The post-Coalition period of aggradation was preceded by a period of erosion. Late Pleistocene soils are frequently truncated, indicating that one or more erosional events occurred sometime during the early- to middle Holocene. It is likely that middle- to late Holocene deposits are less extensively preserved; with Archaic sites often found in secondary context.

LC&T Project and the CRMP

With the significant amount of detailed site information obtained from the excavations and subsequent artifact and sample analyses, the associated baseline studies, the various specialized studies, and the assessment of research questions, the LC&T data recovery program is and will continue to be an invaluable asset for identifying, refining, and answering research issues that are essential for making historic property eligibility assessments and for the long-term management of LANL's cultural resources. The project findings have directly contributed to our understanding and refinement of Pajarito Plateau culture history (Section 5), the types of historic properties present at LANL (Section 6), archaeological site significance and eligibility standards (Appendix B), and other substantive aspects of the CRMP.

Part II. NHPA Compliance: Section 106

Section 8. Overview of NHPA Section 106

Section 106 of the NHPA

Section 106 of the NHPA requires federal agencies to take into account the effects of their undertakings on historic properties and affords the SHPO and/or Tribal Historic Preservation Officer (THPO) reasonable opportunities to comment. In cases such as the finding of an adverse effect by an undertaking, the ACHP will also be afforded the opportunity to comment. The historic preservation review process mandated by Section 106 is outlined in regulations issued by ACHP. The revised regulations, Protection of Historic Properties (36 CFR Part 800), became effective August 5, 2004, and are summarized below.

Initiate Section 106 Process

The responsible federal agency first determines whether it has an undertaking, defined as any activity that could affect historic properties. Historic properties are properties that are either included in the Register, that meet the criteria for the Register, or that await Register eligibility determinations. If the federal agency does have an undertaking, it must identify the appropriate SHPO/THPO, along with other appropriate tribal entities if there is no THPO, with whom to consult during the process. The federal agency should also plan to involve the public and identify other potential consulting parties. If the federal agency determines that it has no undertaking, or that its undertaking is a type of activity that has no potential to affect historic properties, the agency has no further Section 106 obligations.

Area of Potential Effect

In defining the Area of Potential Effect (APE), the Field Office will consider potential direct, indirect, and cumulative effects to historic properties and their associated settings when setting is an important aspect of integrity, as applicable. The introduction of physical, visual, or audible elements has the potential to affect the historic setting or use of historic properties including but not limited to properties of religious and cultural significance to Indian tribes.

Identify Historic Properties

If the federal agency's undertaking could affect historic properties, the agency determines the scope of appropriate identification efforts and then proceeds to identify historic properties in the area of potential effect. The agency reviews background information, consults with the SHPO/THPO and others, seeks information from knowledgeable parties, and conducts additional studies as necessary. Districts, sites, buildings, structures, and objects listed in the Register are considered; and unlisted properties are evaluated against NPS published criteria (36 CFR Part 60; listed below), in consultation with the SHPO/THPO and any Indian tribe that may attach religious or cultural importance to those properties.

- **Criterion A** – Properties associated with events that have made a significant contribution to the broad patterns of history.

- **Criterion B** – Properties that are associated with the lives of persons significant in the past.
- **Criterion C** – Properties that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.
- **Criterion D** – Properties that have yielded, or may be likely to yield, information important in prehistory or history.

In addition to these four criteria, there are seven criteria considerations that are taken into account in the evaluation of Register eligibility. Three of these are applicable to properties at LANL:

- **Criteria Consideration (B)** – A building or structure removed from its original location but which is significant primarily for architectural value, or which is the surviving structure most importantly associated with a historic person or event.
- **Criteria Consideration (E)** – A reconstructed building when accurately executed in a suitable environment and presented in a dignified manner as part of a restoration master plan, and when no other building or structure with the same association has survived.
- **Criteria Consideration (G)** – A property achieving significance within the past 50 years if it is of exceptional importance.

All historic properties identified within the area of potential effect need to be evaluated for Register eligibility. Additionally, incomplete or prior evaluations may need to be redone. If the criteria are met, then the property is considered eligible for inclusion in the Register. If questions arise about the eligibility of a given property, the federal agency may seek a formal determination of eligibility from the NPS. Section 106 review gives equal consideration to properties that have already been included in the Register and those that have not yet been included but that meet Register criteria.

The federal agency must provide documentation of the results of the historic property identification process to the SHPO and must consult with the SHPO. If the agency official and the SHPO do not agree, the ACHP may be requested to arbitrate if the dispute cannot be resolved, in which case the keeper of the Register will make the eligibility determination.

If the federal agency finds that no historic properties are present or affected, it provides documentation to the SHPO/THPO and, barring any objection within 30 days, proceeds with its undertaking (see Section 9 below).

If the federal agency finds that historic properties are present, it proceeds to assess possible adverse effects.

Assess Adverse Effects

The federal agency, in consultation with the SHPO/THPO, makes an assessment of adverse effects on the identified historic properties based on criteria found in ACHP regulations.

If all consulting parties agree that there will be no adverse effect, the federal agency proceeds with the undertaking and any agreed-upon conditions.

If the consulting parties find that there is an adverse effect, or if the parties cannot agree and ACHP determines within 30 days that there is an adverse effect, the federal agency begins consultation to seek ways to avoid, minimize, or resolve the adverse effects.

Resolve Adverse Effects

The federal agency consults to resolve adverse effects with the SHPO/THPO and others, who may include Indian tribes, local governments, permit or license applicants, and members of the public. ACHP may participate in consultation when there are substantial impacts to important historic properties, when a case presents important questions of policy or interpretation, when there is a potential for procedural problems, or when there are issues of concern to Indian tribes.

Consultation usually results in an MOA or data recovery plan, which outlines agreed-upon measures that the federal agency will take to avoid, minimize, or resolve the adverse effects (see also Section 9 below). In some cases, the consulting parties may agree that no such measures are possible, but that the adverse effects must be accepted in the public interest.

Implementation of MOA

If a MOA is executed, the federal agency proceeds with its undertaking under the terms of the MOA.

Failure to Resolve Adverse Effects

If consultation proves unproductive, the federal agency or the SHPO/THPO, or ACHP itself, may terminate consultation. If a SHPO terminates consultation, the federal agency and ACHP may conclude a MOA without SHPO involvement. However, if a THPO terminates consultation and the undertaking is on or affecting historic properties on tribal lands, ACHP shall comment as stipulated in 36 CFR Part 800. If the federal agency terminates consultation, it must submit appropriate documentation to ACHP and request ACHP's written comments. The federal agency head must take into account ACHP's written comments in deciding how to proceed.

Tribes and the Public

Public involvement is a key ingredient in successful Section 106 consultation, and the views of the public should be solicited and considered throughout the process. The regulations also place major emphasis on consultation with Indian tribes and Native Hawaiian organizations, in keeping with the 1992 amendments to NHPA. Consultation with an Indian tribe must respect tribal sovereignty and the government-to-government relationship between the federal government and Indian tribes. Even if an Indian tribe has not been certified by the NPS to have a THPO who can act for the SHPO on its lands, it must be consulted about undertakings on or affecting its lands on the same basis as and in addition to the SHPO.

Section 9. NHPA Section 106 Compliance Review Process at LANL

The Field Offices and LANS integrate cultural resource concerns/reviews into program and project planning in a timely fashion in order to protect significant cultural resources and to avoid unnecessary delays, conflicts, and costs for its undertakings.

Through the Integrated Review Tool (IRT) PR-ID and EX-ID project review system, the LANL Resources Management Team (RMT) conducts approximately 700 to 800 reviews of proposed Laboratory projects each year. These projects range in size and complexity, from routine to specific activities like constructing new buildings, power lines, and utility corridors; repairing and replacing existing signs, paving, utility lines, fencing, and lightning protection; maintaining dirt and paved roadways; installing storm-water gauging stations; relocating sheds and trailers; performing environmental sampling and cleanup at specified areas; and designating pertinent facilities as excess property for eventual demolition.

Compliance reviews and all other work conducted in support of the NHPA at LANL are performed by individuals meeting the professional qualification standards set forth in the Secretary of the Interior's Standards and Guidelines for Archaeology and Preservation (48 FR 44716).

How LANL Cultural Resources Personnel Receive Undertakings for Section 106 Compliance Reviews

In accordance with LANS policy, PR-ID reviews are required for all new or modified projects. DOE and LANS cultural resources subject-matter experts receive notification of projects, or undertakings, in several ways. Project notification occurs most commonly through the Laboratory's IRT process. Notifications are also occasionally received through phone calls and email messages. Cultural resources subject-matter experts review all areas of potential effect for each of these projects—first for accuracy of the location of the project area and then for potential impacts to both archaeological and historical resources, including historic buildings.

The PR-ID process is an institutional tool used to identify and manage potential environmental, safety, and health impacts from proposed or ongoing projects. Among these projects are new construction, programs, and processes; environmental cleanup; experiments; road blading; maintenance and upgrading facilities; and the decontamination, decommissioning, demolition, or shutdown of facilities. Project personnel complete a PR-ID form, which is then posted on a website for designated LANS subject-matter experts to review and post comments. These subject-matter experts review the PR-IDs for potential impacts to the environment, cultural resources, threatened and endangered species, wetlands, created outfalls, potential release sites (PRSSs), and solid waste management units (SWMUs). They also review the PR-IDs for the generation of airborne emissions, new waste streams, and impacts to water quality.

The EX-ID review process is another component of the LANL work-control program. EX-ID permit requests are, as are PR-IDs, reviewed for potential impacts to worker health and safety, the environment, cultural resources, utilities, PRSSs, and SWMUs, or for impacts that would result in unpermitted disposal of hazardous waste. All Laboratory ground-disturbing activities require an EX-ID permit request. These requests go through a review process by subject-matter experts similar to that defined above for the PR-ID process.

Identification, Inventory, and Evaluation

LANS staff identifies historic structures and properties during field surveys and records site and building information using standardized forms. Historic properties include archaeological sites, TCPs, buildings, structures, experimental areas, and discrete groupings of buildings or archaeological sites (e.g., districts). Staff evaluate these properties for Register eligibility employing the criteria for listing in the Register as well as LANL-specific contexts and themes. The Field Office Cultural Resources Program Manager provides the SHPO with documentation for properties deemed eligible and ineligible for inclusion to the Register, requesting the SHPO's comments and concurrence. For the historic built environment, LANS staff typically identify and evaluate resources constructed between 1942 and 1963 (the year the Limited Test Ban Treaty was signed). Given the national significance of LANL's Cold War history, cultural resources less than 50 years of age (i.e., constructed between 1963 and 1990 [the end of the Cold War]) may be eligible as exceptionally significant as defined in 36 CFR Part 60, Criterion A, Consideration G.

LANL-Specific Section 106 Procedures

In April 2000, a programmatic agreement (MOU DE-GM32-00AL77152) was executed between the Field Office, the ACHP, and the New Mexico SHPO for the purpose of specifying and streamlining the management of historic properties at LANL under the NHPA. The PA was designed to be effective for 5 years or until the CRMP was accepted by the SHPO and the ACHP. In June 2005, the PA was extended for one additional year by agreement of the signatory parties. In 2012, the SHPO and the Field Office again extended the PA and agreed that it would remain in place until a revised CRMP was approved. Many provisions found in the April 2000 PA have been incorporated into this section of the CRMP (Section 9) and form the core of LANL-specific Section 106 procedures (Charts 9.1 and 9.2).

Ineligible Archaeological Site Categories

The following archaeological site categories at LANL are deemed ineligible for inclusion in the Register provided they have been potentially eligible under Criterion D only and that the archaeological data (i.e., 100-percent collected) are either inaccessible or lost:

- Previously completely excavated sites, destroyed sites, and 100-percent collected artifact scatter sites, or artifact scatter sites that have been substantially collected (i.e., early archaeological research and sites collected by the Pajarito Archaeological Research Project). Eligibility for sites that have been substantially collected will be evaluated on a case-by-case basis.

Property Types and Undertakings Exempt from Section 106 Identification and Evaluation

The following property types are exempt from Register evaluation due to lack of significance:

- Structures with minimal or no visible surface manifestations (i.e., pits; underground storage tanks; underground vaults; buried material disposal areas; septic tanks; underground pipelines; sewer lines; and steam, storm-water, acid, or electrical manholes)
- Aboveground fuel and water tanks

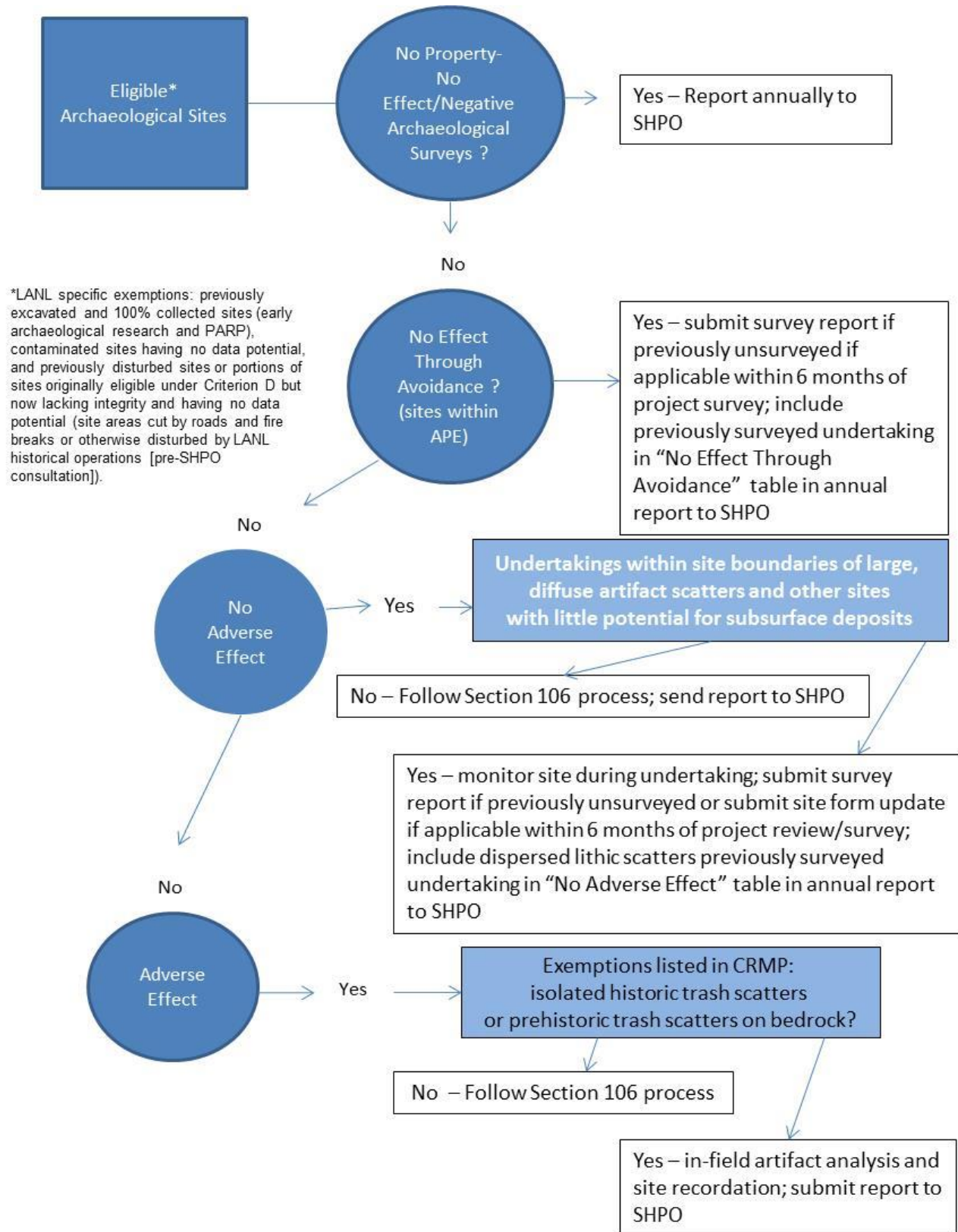


Chart 9.1. LANL-specific Section 106 process for archaeological sites

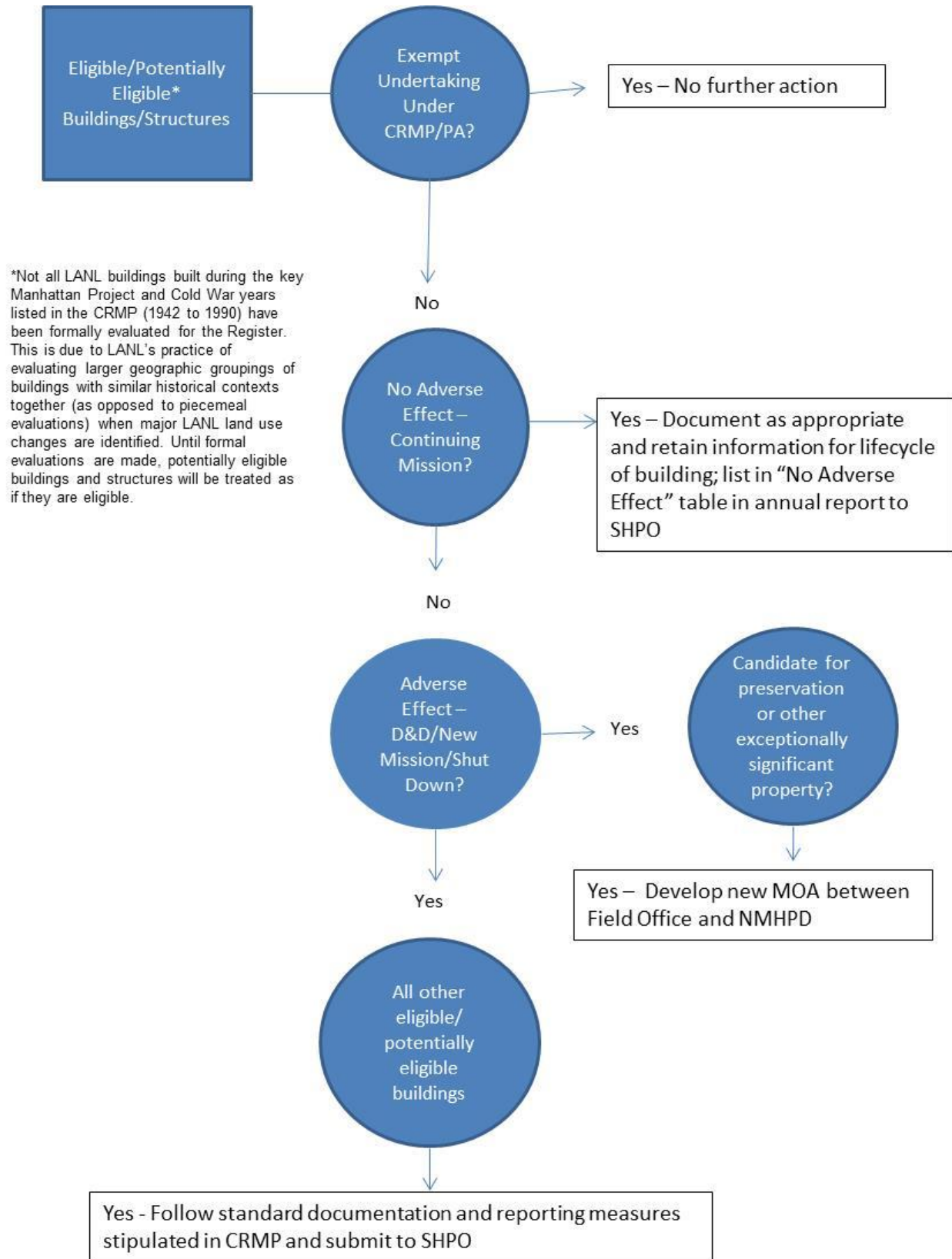


Chart 9.2. LANL-specific Section 106 process for historic buildings

- Wells and boreholes
- Road-block barriers
- Transformer and pressure-relief-valve stations
- Mobile trailers and modular buildings and enclosures—these structures are used either as mobile trailers that are moved on-site, or pre-manufactured sides and roofs typically resting on poured concrete pads. They serve as temporary administrative support office space or storage facilities.

All undertakings, including exemptions, are reviewed through the integrated review tool by Secretary of Interior qualified cultural resource staff. However, the following activities or undertakings are exempt from cultural resource management review, provided that (a) they do not affect or have the potential to affect those qualities that make a historic property eligible for the Register and (b) that they do not involve ground-disturbing activities. Ground disturbance is defined as any activity that compacts or disturbs the ground within an area that has been previously disturbed and contains no cultural deposits.

- Pavement milling, overlay, chip seal, or rehabilitation on existing roads when the typical section is not increased to include new shoulders or travel lanes
- Routine maintenance on existing fire roads and fire breaks that were historically bladed through historic properties where no intact cultural deposits remain or in areas that have had gravel/base course placed over remaining cultural deposits
- Replacement or removal of general equipment of facility components
- Installation, maintenance, repair, storage, relocation, removal, or replacement of process or laboratory equipment and associated systems
- Siting, installation, maintenance, repair, removal, and operation of plant water systems
- Siting, installation, maintenance, repair, removal, or replacement of plant and building electrical systems
- Siting, installation, maintenance, repair, removal, or replacement of communications and computer systems
- Routine service activities such as mowing and trimming grass, shrubs, or trees; moving furniture and equipment; snow removal; erosion control; housekeeping services; small-scale road, sidewalk, and parking-lot repair; maintenance and repair of vehicles and equipment, non-historic fencing and signs; maintenance of safe/vaults and locks; and routine decontamination of tools, surfaces, and equipment
- Operation and maintenance of waste treatment, storage, and disposal facilities
- Maintenance, repair, modification, or direct in-kind replacement or refinishing associated with structures or buildings

- Installation, maintenance, repair, or replacement of equipment used in current operations designed to maintain compliance with permits and Occupational Safety and Health Act regulations and Americans with Disabilities Act regulations
- Installation and maintenance of features for hazard prevention of equipment, buildings, and structures
- Installation, maintenance, removal, and repair of security systems
- Installation, maintenance, removal, repair, or replacement of heating and air conditioning systems
- Modifications to steam condensate systems and chemical treatment systems
- Routine upgrades and modifications to fire protection systems
- Removal of asbestos-containing materials from existing buildings and structures
- Removal of polychlorinated-biphenyl-contaminated items
- Installation or modification of personnel safety systems

No Property Undertakings

Those undertakings determined to have no direct or indirect effect on historic properties because no eligible and/or potentially eligible (unevaluated) properties are present in the area of potential effect (“No Property/No Effect”) will be allowed to proceed. These will be reported on an annual basis to the SHPO pursuant to Section 11 with the survey report available for review and comment. The report will be submitted within six (6) months of completion of the survey if the area of potential effect has been previously unsurveyed. If it exceeds 6 months, the Field Office will consult with the SHPO.

No Effect Undertakings

Undertakings that have no direct or indirect effect because eligible and/or potentially eligible (unevaluated) properties within the area of potential effect will be avoided by project activities will also be allowed to proceed. These will be reported to the SHPO with the documentation available for review and comment. A survey report and associated forms for archaeological sites and/or historic structures will be submitted if the area of potential effect has been previously unsurveyed. Documentation entered into the New Mexico Cultural Resource Information System (NMCRIIS) and will be submitted to the SHPO within six (6) months of the survey. If it exceeds 6 months, the Field Office will consult with the SHPO.

No Adverse Effect Undertakings

Archaeological Sites

If an undertaking is determined to have no adverse effect, the Field Office will notify the SHPO, Indian tribes, and consulting parties pursuant to 36 CFR 800.6(a).

Historic Buildings

The interior remodeling or renovation of Register-eligible properties, where those modifications or renovations support the continued LANL mission, will be considered to have no adverse effect. These modifications will be subject to SOI qualified cultural resource staff review (through the Integrated Review Tool process). Archival quality digital photographs will be taken of the interior of the property prior to commencement of work. Mission related upgrades, remodeling, or renovation to the exterior of Register-eligible buildings will be allowed to proceed following SOI qualified cultural resource staff review provided that the modifications are in keeping with LANL's industrial and administrative vernacular architecture style.

The Field Office and SHPO are consulted on these undertakings. Mission related upgrades will require photographic documentation of the present condition, review of archival photographs, and the collection of architectural plans and drawings. These documents and photographs will be compiled and maintained at LANL throughout the life cycle of the property.

Adverse Effect Undertakings

All undertakings determined to have an adverse effect to an eligible property will have a plan developed to resolve the adverse effect. This plan may include (1) modifying the undertaking to avoid the property, (2) modifying the undertaking to minimize the adverse effect, (3) completely documenting the property if the property is a building or structure, and/or (4) partially or completely excavating an archaeological site for data recovery.

For undertakings that may affect Register-eligible historic and/or prehistoric archaeological sites, the Field Office will follow the procedures contained in 36 CFR Part 800.5–800.6, with the following exceptions: (1) adverse effects to surface historic trash scatters and (2) prehistoric artifact scatters and rock features on bedrock and/or secondary contexts. These two cases will be reviewed and resolved as outlined below, with the following data-recovery procedures carried out in lieu of procedures set forth in 36 CFR Part 800.

Isolated trash scatters are historic sites that are temporally associated with the Homestead to Cold War occupation of LANL (1890 to 1990) but are not physically associated with any homestead feature, patented homestead site, or Manhattan or Cold War facility and may have limited research information potential. Isolated trash scatters typically represent remote dumping activities and may even compose a single dumping event. Data recovery will include a detailed recording of the site (if not already done) and the analysis of surface artifacts (carried out in the field unless additional information would be gained through subsequent laboratory analysis). Results of any data-recovery project carried out under this provision will be reported to the SHPO.

Prehistoric artifact scatters represent activity areas that on the Pajarito Plateau are primarily associated with the Archaic period (5500 BC to 600 AD lithic scatters) or the Ancestral Pueblo period (AD 600 to 1600 AD lithic and/or ceramic scatters). Isolated rock features are frequently of unknown cultural affiliation. Prehistoric artifact scatters and isolated rock features situated on bedrock will be mitigated through in-field data recovery. With the limited data potential resulting from the proximity to bedrock and/or secondary context, the information content of these sites will be exhausted through in-field analysis and site recordation. Data recovery will include site recording and an in-field analysis of artifacts. Should there be potential for additional

information to be gained through subsequent laboratory analysis, limited numbers of artifacts may be collected. Data recovery of rock features will consist of a precise description of the feature, a site sketch, photographs, and in-field analysis of any associated artifacts. Collection and subsequent laboratory analysis may be conducted for artifacts with the potential to yield additional information. Native American organizations will be consulted concerning the potential of these sites to be TCPs. Results of any data-recovery project carried out under this provision will be reported to the SHPO.

Adverse effects to Register-eligible buildings and structures will be resolved according to the procedures listed below, except for those historic buildings and structures deemed Candidates for Preservation and discussed in Section 10. Creative mitigation measures intended to augment traditional measures for minimizing adverse effects to exceptionally significant properties require consultation with the SHPO on a case-by-case basis (see Development of Preservation Plans for Identified Properties, Section 10).

Notification of the intent to implement the following standard procedures resolving adverse effects will be sent to the SHPO and the ACHP and will include information related to the nature of the adverse effect and the building or structure's historic function and level of significance.

Demolition or Major Remodeling

The following documentation will be conducted before demolition or major remodeling begins:

1. The interior and exterior of the building or structure will be photographed. Archival-quality digital photographs will be produced.
2. Historically significant equipment and artifacts associated with historic properties will be identified and fully documented before removal or demolition, and curation of these items will be coordinated with Bradbury Science Museum staff. The Bradbury Science Museum is a Field Office owned facility. These artifacts may have interpretive or educational value as exhibits within local, state, or national museums and will be curated, as appropriate, at LANL. The identification and archiving of extant historical records will be coordinated with LANL archives or records management personnel, as appropriate.
3. A listing of all LANL drawings for the property will be compiled, and an 11 x17 copy of the selected reduced-scale key drawings will be submitted to the SHPO. If available, drawings and technical schematic plans depicting any significant instrumentation or equipment historically housed in the property will be submitted (note: significant experiments or engineering systems may be candidates for additional documentation). Documentation will include a map showing the location of the property relative to the entire LANL property. Additionally, the general site area will be documented so that there will be a permanent archival record of the history and appearance of the technical area where the property is located. A LANL technical area is a geographically-defined administrative unit within LANL. A site map will also be generated depicting, at a sufficient scale, the footprint of each eligible and non-eligible building or structure within the associated technical area. A series of historic site maps, representing the technical area's construction history, will also be included.
4. A written history will be prepared and will include a use history of the eligible property supplemented with information from oral interviews. This use history will include a

discussion of the associated technical area's role at LANL, its historical significance, and a comparison of its mission with similar missions historically conducted at Los Alamos or at other DOE Manhattan Project or Cold War facilities, as applicable. LANL historic building survey forms, with representative drawings and photographs, will also be included.

5. A final report with all associated documentation will be submitted to the SHPO (along with a notification to the ACHP) within twelve (12) months after the undertaking is complete. Archival photographic prints will be retained at LANL and digital photo files will be stored on a LANL server.

Mission Changes / Building Closure

Mission change is defined as a new use not related to the original historic function of the building.

1. Closure undertakings involving buildings are typically known as "Cold & Dark" or "Cool & Dim" projects and often include the relocation of personnel, the abandonment of records, and the removal or salvaging of equipment, experiments, and other interior fixtures. Cold & Dark projects usually involve permanently disconnecting power and other utilities. Neglect of a Register-eligible or potentially eligible (unevaluated) property, which causes its deterioration, will be considered an adverse effect per 36 CFR 800.5(2)(v). Properties that are "Cold & Dark" or "Cool & Dim" are especially susceptible to demolition by neglect. To avoid an Adverse Effect, sustained maintenance and repair of these properties is necessary (see 36 CFR 800.5(2)(v)).

The following documentation will be compiled and maintained by LANL throughout the life cycle of the property.

1. Before significant mission changes or building closure activities, the interior and other affected areas of the building or structure will be photographed. Archival-quality digital photographs will be produced.
2. Historically significant equipment and "artifacts" associated with historic properties will be identified before the shutdown, and curation of these items will be coordinated with Bradbury Science Museum staff. These artifacts may have interpretive or educational value as exhibits within local, state, or national museums and will be curated, as appropriate, at LANL. The identification and archiving of any extant historical records will be coordinated with LANL archives or records management personnel, as appropriate.
3. A list of former workers will be compiled, especially those individuals with institutional knowledge of historical facility operations. Oral interviews will be conducted as appropriate.

Negative Archaeological Surveys

Archaeological surveys conducted in a previously unsurveyed portion of the Laboratory may result in a negative finding. LANL does maintain spatial and tabular site and survey data in its corporate database of LANL sites and will provide information documenting negative surveys to the SHPO on an annual basis.

LANL-Specific Section 106 Reporting and Communication

Email Communication

Following SHPO guidance, email communications will be permitted (from the Field Office to SHPO staff) for Section 106 notifications regarding the implementation of standard in-field data recovery and historic building documentation measures resolving adverse effects (exceptions as identified in Section 9).

Annual Report to SHPO

The Field Office will prepare and submit an annual report to the SHPO by January 15. The report will include succinct information on:

- List of “No Effect” undertakings and reason for the determination.
- List of legacy reports completed and number of reports remaining.

The annual report will be in table format and will include the following types of information as appropriate:

- Review date or date of action
- Project title with brief description of the project technical area
- LA (Laboratory of Anthropology) number or LANL building number
- Site type/building type
- Site affiliation/date built
- Site/building location

Section 10. Methods, Procedures, and Goals for Management of Post-1942 Historic Buildings and Structures at LANL

Goals for the Management of Historic Buildings and Structures at LANL

Beginning in 1943 and continuing to the present, a large number of buildings and structures have been constructed at LANL, many of which have been renovated, moved, or demolished. The distinction between buildings and structures is that buildings are designed for sheltered occupancy by humans, animals, and materials, while structures are architectural and engineering features not meant to be occupied (e.g., berms, firing pits, utility corridors, landscape elements). Together these are commonly referred to as the built environment.

The CRMP defines a number of steps and goals for evaluating and managing the post-1942 historic built environment at LANL in compliance with Section 106 and Section 110 of the NHPA. Key elements include historic context statements, an oral history program, public outreach and interpretation, and the continuation of a LANL-wide historic properties identification and evaluation effort, prioritized by the risk to historic properties from mission-related activities.

DOE/LANS management of its post-1942 historic built environment through this CRMP is intended to be flexible and subject to periodic review and revision. The CRMP functions as a framework for both short- and long-term management actions related to historic properties.

Historic Buildings and Structures Assessment Process at LANL

As discussed above in Section 9, there are several types of buildings and structures that are exempt from evaluation requirements. Nonexempt buildings and structures at LANL, dating from 1942 to 1956 (Manhattan Project and early Cold War era), from 1957 to 1963 (ending with the signing of the Limited Test Ban Treaty), and 1964 to 1990 (ending with the end of the Cold War signified by the fall of the Berlin Wall reuniting Germany) are currently being identified and evaluated for effects from proposed Laboratory undertakings. Because of the national significance of LANL's Cold War activities, properties less than 50 years of age may also be identified and evaluated for their exceptional significance as defined in Criteria Consideration G. These include the most significant operating facilities at LANL (some the "key facilities" listed in the 2008 LANL SWEIS [DOE 2008]). The historic built environment at LANL includes, but is not limited to, buildings, structures, experimental areas, and discrete groupings of built environment features considered together as historic districts.

To date, not all LANL buildings built during the Manhattan Project and Cold War years listed in the CRMP (1942 to 1990) have been evaluated for inclusion in the Register. Until evaluations are made, these buildings and structures will be treated as if they are eligible.

The inventory of all extant previously declared ineligible properties will be reviewed for changes to historical significance based on the passage of time and a greater understanding of Laboratory contribution to national history. As of August 2016, 316 of the 442 historic properties on the inventory have been evaluated (159 eligible and 157 ineligible). There are 126 historic properties that still need to be evaluated.

Register Eligibility Assessments

As mentioned above, Register eligibility assessments are being conducted for buildings and structures built between 1942 and 1963. Initial eligibility assessments include both historical background information and property descriptions. The assessment reports also include location maps, photographs, and current floor plans of properties. The documentation of historic properties and associated equipment is conducted in two stages: field visits and historical research (specific methods are detailed below). During the initial field visit, resources management staff document each property's architectural and engineering elements. The exterior and interior of the properties are described following the format of the LANL historic building survey form. Moreover, representative views of the properties are digitally photographed, significant equipment is noted, and overall physical integrity is determined.

In addition to the field visits, RMT staff conducts research regarding the history of operations at each property. Research sources include as-built and historic engineering records, information provided by current and former site workers, documents housed at the LANL records center and archives, and historic LANL photographs. Photographic resources may include general facility photographs, aerials, and photographs of experiments. Preliminary historical information is often available from the Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) work plan reports. The background information contained in these reports was gathered by

LANL's Environmental Restoration (ER) Project during the 1990s in support of the characterization of LANL technical areas.

Evaluation efforts are based on the application of the criteria for eligibility established in 36 CFR Part 60. In general, buildings and structures must be 50 years old or older and meet at least one of the four criteria of eligibility to be eligible for inclusion in the Register. Occasionally, a property, although less than 50 years old, is associated with an event of exceptional significance and can be eligible for the Register under Criteria Consideration G, "exceptionally important properties that have achieved significance within the last fifty years."

In compliance with Section 106 of the NHPA (as amended), eligibility assessment reports are submitted to the Field Office for transmittal to the SHPO for review and concurrence. All historic building compliance documents are reviewed by the Safeguards Division (SAFE) Classification Group (SAFE-1) at LANL and are assigned a Los Alamos unlimited release (LA-UR) publication number before submittal to the SHPO.

Integrity

Integrity is the ability of a property to convey its significance. In compliance with Section 106 of the NHPA (as amended), eligibility assessment reports will include evaluation of the property's integrity as identified in National Register Bulletin 15.

The Role of Historical Contexts in Eligibility Assessments

LANL cultural resources managers are currently conducting Multiple Property evaluations of Manhattan Project— and Cold War—era facilities in support of the Field Office's NHPA compliance process. Short- and long-term planning decisions at LANL—coupled with the scheduled decontamination, decommissioning, and demolition of aging and obsolete facilities—are key factors in the decision to evaluate LANL's historic properties as a contextually related grouping of buildings and structures and not, as has been carried out in the past, on an individual basis.

A key element of Multiple Property documentation is the development of a historical context. Contexts provide information about historical patterns and trends and identify themes, geographical areas, and chronological periods. In order to determine Register significance, LANL properties are viewed in light of their associated historical contexts and themes. The Multiple Property documentation and its contextual emphasis is an even more important evaluation tool when a determination of "exceptional significance" is being considered for a property built in the last 50 years (Criteria Consideration G). LANL has developed site-wide contexts covering the Manhattan Project era (1942–1946) and the Cold War (1947–1990) (McGehee et al. 2003a, Machen et al. 2010). Other LANL Multiple Property assessment reports contain historical context information specific to World War II and Cold War technical areas and facilities.

DOE site-wide contexts that have strong associations with LANL's Cold War mission include Nuclear Weapon Components and Assembly; Nuclear Weapon Design and Testing; Nuclear Propulsion; Peaceful Uses: Plowshare, Nuclear Medicine, Nuclear Energy, and Nuclear Science; and Energy and Environment. Because of the complexity of subthemes associated with LANL's primary Cold War context (Nuclear Weapons Research and Development), this context

statement is being completed in two phases. The first phase, an umbrella context document, was completed in 2011 (Machen et al. 2010). The umbrella context presents general chronological and geographical information, identifies historical trends, and places local activities in a broader national context. The umbrella document also lists properties that are potentially associated with the overall context statement and, most importantly, identifies the key LANL themes. The second phase will consist of specific thematic documents. Two examples of thematic documents are related to the LANL themes and subthemes of Weapons Research, Development, Testing, and Stockpile Support-Security; and Biomedical/Health Physics-Radiation Effects on Humans/Animals (Garcia et al. 2015a, Garcia et al. 2015b). Thematic documents are more in-depth historical discussions of identified themes, emphasizing local historical patterns, trends, and interrelationships. Ultimately, local themes will also be placed within the broader history of LANL, the DOE, the nation, and the world.

Identified LANL themes and subthemes, many spanning both the Manhattan Project and Cold War periods, are listed below.

- **Weapons Research, Development, Testing, and Stockpile Support:** Atomic Bomb, Hydrogen Bomb, Technical Development (HE, Initiators, Detonators, Limited Production), Pacific Testing, Nevada Test Site [NTS] Testing, Treaty Verification, and Nuclear Safety and Security
- **Supercomputing:** ENIAC, Monte Carlo, MANIAC, Stretch
- **Reactor Technology:** Clementine, LOPO, SUPO, HYPO, Omega West, LAMPRE, UHTREX, KIVA, Godiva, Rover/Nuclear Propulsion
- **Biomedical/Health Physics:** Radiation Effects on Humans/Animals, Fatalities, Standards, Exposure Limits, Shielding, Bioassay, Remote Handling, Medical Isotopes
- **Strategic and Supporting Research:** Nuclear Science, Pioneering Physics, Energy Research
- **Environment / Waste Management:** Material Disposal Practices, Waste Management, Cleanup, Demolition and Decommissioning
- **Administrative and Social History:** General Administration of Facility, Social Organization of Laboratory and Town, Security Practices, Civil Defense
- **Architectural History:** Construction and Demolition History, Architectural Styles

Detailed Procedure for Documenting the Historic Built Environment

Property Databases and LANL Facility Management Information

The LANL cultural resources building database is accessed to gain initial information about a building. Available information usually includes construction dates, names of properties, original and current functions, and lists of schematic drawings for each property. LANL facility databases also have information about the original name and number of a property (if it has changed through time), the builder, construction type and material, and additions and their construction dates.

Engineering Drawings

If available, drawings showing plot plans, elevations, floor plans, structural sections, roof details, and additions are copied from the LANL engineering records department. Some of the building drawings are classified as official use only (OUO) documents. Before the inclusion of these drawings in written compliance documentation, they are reviewed by SAFE-1 to ensure that there is nothing classified in the drawings and that they are releasable to the public. Copies of the original as-built elevations and floor plans and the most current as-built elevations and floor plans are obtained for use during field visits to record and verify the building architectural characteristics.

Initial Background Research

ER Project RFI work plans are consulted for information pertaining to the original function of a property, including any PRSs in the area that are also indicators of the operations in the building or structure. During the 1990s, the ER Project conducted historical research on the operations taking place at different outdoor experimental areas as well as buildings. The RFI work plans and associated references are used as initial sources for historical background information.

Field Visits

Once initial background information is gathered, a walk-through of the facility is conducted. If possible, the walk-through is done in the company of a person knowledgeable of the history of the facility, such as a current or former site worker, as well as someone representing the proposed project. Digital photographs of the facility's exterior and interior are taken and reviewed by a LANS derivative classifier or personnel from SAFE-1 to make sure there are no classification issues. The digital photographs are used in the initial historic building eligibility assessment report. Occasionally, photography is not allowed for security reasons.

An assessment of existing original equipment is conducted during the field visit. In the event that historically significant project equipment exists in a building, a walk-through of the facility is scheduled with representatives from the Bradbury Science Museum to see if there is anything that should be retained for future exhibits. Such equipment is stored at LANL's cultural resources facilities or the museum's warehouse. Personnel from SAFE Division evaluate items of interest for public display or loan to other institutions. Items removed from facilities are screened for contamination in accordance with the policies of the current facility management.

LANL Historic Building Survey Forms

The information from field visits, historical research, and engineering drawings is used to complete a historic building survey form.

Historic Photographs

The Laboratory's photographic archives are searched for historic building photographs. These photographs are used in the eligibility assessment reports and in the final documentation reports.

Geographic Information System Maps

Cultural resources managers prepare Geographic Information System (GIS) maps as part of the building documentation process. These maps show the location of the building(s) within their specific LANL technical area and in relationship to the rest of the Laboratory.

Oral History Program

Whenever feasible, oral history interviews are conducted to supplement the historical documents, drawings, and photographs associated with the activities carried out in a historic property. Oral interviews of current and former site workers are conducted according to LANS security protocols and following professional oral history standards. Unless otherwise requested by the participant, interviews are recorded and notes are also taken. The recorded interviews are retained and archived at LANL, and interviews may be transcribed. Some of the information contained in the interviews may not be available for public dissemination. If appropriate, verbatim transcripts or interview notes are included in the appendixes of the final documentation reports. In most cases, information from the interview is also incorporated into the text of the report.

Historical Significance

In evaluating the historical significance and integrity of LANL properties, the RMT looks at (1) the use history (the original and current function), (2) the building's architecture, (3) the presence of any additions or modifications, and (4) the building's physical integrity. Oral interviews are conducted with site workers to evaluate historical significance and integrity. Information gathered through oral interviews conducted with site workers is also used in the evaluation of historical significance and integrity.

Eligibility Criteria

Evaluation efforts are based on the application of the criteria for eligibility established in 36 CFR Part 60. Additional evaluation guidance with special relevance to the LANS cultural resources program is included in the ACHP's "Balancing Historic Preservation Needs with the Operation of Highly Technical or Scientific Facilities" (ACHP 1991). These criteria are detailed in Section 2. The NPS has written several publications that list the criteria for eligibility and provide guidance for the assessment of historic properties. National Register Bulletin 15 (NPS 2002) explains how to apply the Register Criteria for Evaluation. Selection criteria for recent properties are given in National Register Bulletin 22, "Guidelines for Evaluating and Nominating Properties that Have Achieved Significance within the Last Fifty Years" (NPS 1979).

There are four general property types associated with LANL's historical themes:

1. **Laboratory-Processing Buildings** such as HE and tritium processing and research facilities.
2. **Administration Buildings** such as office buildings and facilities housing cafeterias and health and safety offices (change rooms and offices for radiological monitoring staff).
3. **Security Buildings and Structures** such as guard stations, security lights, and fencing.
4. **Support Buildings and Structures** such as warehouses, water tanks, utilities, and waste treatment facilities.

Integrity Review for Buildings

Integrity is the ability of a property to convey its significance. In compliance with Section 106 of the NHPA (as amended), eligibility assessment reports will include evaluation of the property's integrity as identified in National Register Bulletin 15.

Curation of Artifacts, Records, and Photographs

In accordance with federal legislation 36 CFR Part 79, Curation of Federally Owned and Administered Archaeological Collections, significant historical artifacts and architectural elements, if not contaminated, are retained and curated at an appropriate LANL facility. Although LANL's prehistoric collections are curated at the Museum of Indian Arts and Culture under formal agreement with the Field Office, historic artifacts, including scientific equipment and building fixtures, are curated at the DOE owned Bradbury Science Museum in Los Alamos and at storage facilities at the Bradbury and at other areas across LANL because of the size and industrial nature of the artifacts. In September 2014, the Environmental Research and Monitoring Exhibit opened at the Bradbury Science Museum. Several Ancestral Pueblo period artifacts are displayed in this permanent outreach and education exhibit. These scientific artifacts may also have interpretive or educational value as exhibits within local, state, or national museums.

LANL drawings are archived on microfiche cards and stored at the LANL archive and records center. Some of the drawing records have been scanned and are available to LANS employees electronically. LANL photographs, including original negatives, are archived at both the main photographic facility and at the LANL archives and records center. Digital photo files are archived on LANL servers (at the archives and records center and on EPC-ES servers). The largest single repository for historic LANL documents is the archives and records center; however, pertinent historical documents are sometimes retained by individual LANS organizations and at other DOE facilities, federal records repositories, and at the National Archives II in College Park, Maryland.

Exceptionally Significant Historic Buildings and Structures

Modification, restoration, or demolition undertakings with the potential to adversely affect exceptionally significant buildings and structures will require the development of formal MOAs between the SHPO and the Field Office. The SHPO will be consulted on creative mitigation measures intended to augment traditional measures for minimizing adverse effects to exceptionally significant properties on a case-by-case basis.

Development of Preservation Plans for Identified Properties

Thirty-seven historic buildings and structures at LANL have currently been identified as candidates for long-term retention and management. As additional significant buildings are identified they may be added as candidates for preservation. Seventeen properties listed below (and marked with an asterisk) may be added to the existing Los Alamos Scientific Laboratory (LASL) NHL District (currently being revised), and signed, Congressional park legislation may also include them in a Los Alamos unit of the Manhattan Project National Historical Park (see Section 15). The other 17 buildings are being considered for inclusion in a potential Cold War period NHL District (see Section 15).

- TA-6-37, Concrete Bowl*
- TA-8-1, Gun Site Laboratory and Shop,* along with TA-8-2, Shop and Storage,* and TA-8-3, Laboratory*
- TA-8-172, Portable Guard Shack*

- TA-11-1, Control Building*
- TA-11-2, Betatron Building*
- TA-11-3, Cloud Chamber Building*
- TA-12-4, Hexagonal Firing Pit*
- TA-14-6, Shop/Darkroom Building*
- TA-16-54, Grinding Building/Instrumentation/Testing*
- TA-16-58, HE Magazine*
- TA-16-430, -435, and -437, Press Building Complex
- TA-16-516, V-Site Assembly Building*
- TA-16-517, V-Site Equipment Building*
- TA-16-1451, Back Gate Guard Station
- TA-18-1, Slotin Building*
- TA-18-2, Battleship Bunker/Control Building*
- TA-18-5, Battleship Bunker/Control Building*
- TA-18-23, Critical Assembly Building, Casa #1
- TA-18-26, Hillside Vault
- TA-18-29, Pond Cabin*
- TA-18-186, Guard Tower
- TA-22-1, Fat Man Assembly Building / Quonset Hut*
- TA-33-27, Guard House
- TA-33-28, Water Tower
- TA-41-1, -2, -3, -6, Underground Vault, Guard Station, Blower House, Covered Passageway Complex
- TA-60-17, -19, Assembly Building and Rack Tower Complex
- TA-60-45, High Frequency Radio Facility
- TA-72-8, East Jemez Guard Station – “Sandia Gate”
- TA-73-15, East Gate Guard Tower

Preservation plans for identified properties will be developed by DOE and LANS staff and reviewed by the SHPO. These plans will identify regular inspection and maintenance schedules, funding sources, property managers, and acceptable reuse functions. While repairing or maintaining the properties, LANL will follow guidance published by the Department of Interior

in The Secretary of the Interior's Standards for the Treatment of Historic Properties. In order to avoid inadvertent impacts, signs will be posted at each exceptionally significant building and structure that clearly indicate the historic nature of the facility and state that maintenance work is subject to historic preservation requirements.

Strategies for Adaptive Reuse

In accordance with Section 110 of the NHPA, other uses for historically significant, uncontaminated properties should be developed as an alternative to demolition. Alternate uses could include office space, storage, and interpretative areas. LANL adaptive reuse plans will incorporate recent guidance developed by the ACHP regarding the integration of NHPA with EO 13514 when rehabilitating historic buildings. New DOI guidelines on sustainability for rehabilitating buildings will also be consulted (DOI 2011).

Identification of Long-Term Maintenance Requirements for Exceptionally Significant Buildings and Structures

Buildings and structures at LANL that are Candidates for Preservation will each be maintained in accordance with individual preservation plans as described above.

Section 11. Methods, Procedures, and Goals for Archaeological Resources Management at LANL

All archaeological work conducted at LANL is accomplished within a rigorous set of standards, procedures, and goals. This includes fieldwork [survey, excavation, field checks, the monitoring of project activities, and the use of the Global Positioning System (GPS)], laboratory work (washing, labeling, analysis, and long-term storage of artifacts), compliance review, the preparation of archaeological reports, and other aspects of cultural resources management involving the use of archaeological skills and personnel.

Archaeological Site Significance Standards at LANL

The criteria for listing in the Register, as well as LANL-specific contexts and research themes, are used to evaluate archaeological sites for Register eligibility. Archaeological sites are generally determined eligible under Criterion D; however, Criteria A, B, and C are appropriate in limited situations. Under Criterion A, a property must have well-preserved features, organization, and artifacts that illustrate an event or pattern of events. Under Criterion B, a site must be illustrative of a person's life. Criterion C may apply to sites that illustrate important concepts in precontact community design or are important representatives of the aesthetic values of the area cultures, i.e. rock art sites are generally eligible under Criterion C.

Under Criterion D, a property is eligible if it has been used as a source of data and contains more as-yet retrieved data or if through testing or research it has been determined to be a likely source of data. Under this latter requirement, the information must be evaluated within an appropriate context to determine its importance. Information is considered important when it is shown to have a significant bearing on a research design derived from historic contexts that contains three primary elements (1) a theme or research topic, (2) a time period to which the research topic relates, and (3) a geographic area for which the research theme is applicable.

A general research design (significance standards) for the conduct of archaeological work at LANL was developed in association with excavations and laboratory analyses as part of the DOE LC&T Project (Vierra and Schmidt 2008). This overarching research design was reviewed by the SHPO and the ACHP and was provided to culturally affiliated Native American tribes.

Register Eligibility Assessments

Property types link the ideas incorporated in the theoretical historic context with actual historic properties that illustrate those ideas. Site types are a grouping of individual properties based on shared physical or associative characteristics. The process of assessing Register eligibility of archaeological properties begins with defining site types and characterizing the locational patterns, current condition, inherent characteristics, and aspects of the social and natural environment that might affect the preservation of the property type. There are currently 20 archaeological site types identified at LANL including Archaic lithic scatters, Coalition-period roomblocks, and Homestead-era structures.

There are three potential outcomes of an archaeological property eligibility assessment: eligible, undetermined, or not eligible. A property or site is eligible if it has been used as a source of data and contains more, as-yet unrecorded data, or if it has not yet yielded information but, through testing or research, is determined a likely source of data. Sites that require additional investigation, such as archaeological testing, to determine their potential for containing research information are assessed to have an undetermined eligibility. All sites that have an undetermined eligibility assessment are considered and evaluated as a Register-eligible property until such time as additional investigative measures are completed and the site is reevaluated. Sites that have no additional research potential are assessed as not eligible for the Register. All sites that have yet to be evaluated for Register eligibility are treated as eligible under the NHPA until definitive determinations can be made (see Appendix B for more in-depth site eligibility discussion).

Archaeological properties at LANL are evaluated for Register eligibility as part of the site documentation process. The first step in the evaluation process is to determine the site type and associated time period, which establishes the context from which to assess the site's relevance for addressing LANL and Pajarito Plateau research issues. This first step involves documenting the site location, setting, and extent and nature of the cultural materials including architecture, features, and artifacts. The second step is to determine whether the site has the integrity such that it can address applicable research issues. Determining site integrity primarily involves establishing the presence of intact architecture and features and undisturbed subsurface deposits. Factors assessed include topographic location, depositional/erosional environment, depth and nature of soil deposits, evidence of bioturbation, and evidence of human impacts from previous excavations, land development, or vandalism.

The above site information, including the site eligibility evaluation derived from it, is collected on a Laboratory of Anthropology site record and entered into a New Mexico Cultural Resources Information System (NMCRIIS) site form. Additional site information collected in support of the NMCRIIS site form includes a GPS-derived site boundary, site and feature sketch map(s) or GPS-derived map(s), photographs, and in-field artifact analysis data. The site documentation and associated eligibility assessment report is submitted to the Field Office for transmittal to the SHPO for review and concurrence and subsequent submittal to the State of New Mexico Archaeological Records Management Section. Archaeological site compliance documents are reviewed by SAFE-1 and are assigned a Los Alamos limited (controlled) distribution release

publication (LA-CP) number intended to protect archaeological site location and other potentially sensitive information that is protected by law. Documents with this designation are treated as OUO and should not be released to the public.

Integrity

According to National Register Bulletins 15 and 36 (NPS 1990, NPS 2000), to be listed in the National Register of Historic Places, a property must not only be shown to be significant under the National Register criteria, but it also must have integrity. Historic properties either retain integrity or they do not. Within the concept of integrity, the National Register criteria recognize aspects or qualities that, in various combinations, define integrity. These include location, design, setting, materials, workmanship, feeling and association. To retain historic integrity, a property will always possess several of the aspects. Archaeological site integrity is commonly defined by several factors, including the presence of undisturbed (in situ) surface and subsurface deposits, intact architecture, and features. Site assessments for integrity must include a determination of which aspect of the site can provide information that is relevant to answering specific research questions. Integrity is most easily assessed at archaeological sites that contain obvious surface evidence of architecture (e.g., roomblocks). Assessment becomes somewhat more difficult for those sites with minimal architecture or features (e.g., one- to three-room structures, agricultural features, or rock features). Finally, assessment can be difficult at surface artifact scatters that exhibit no obvious surface features and for which the nature of subsurface cultural deposits is difficult to discern.

Surface artifact scatters reflect the ephemeral remains of temporary campsites or limited-activity locations and are often difficult to evaluate for potential significance. Criterion D provides three general contexts that are commonly used to evaluate data potential from subsurface artifact scatters: chronology, technology, and geomorphology. Chronology refers to the presence of datable materials, which can be used to temporally place the site. Technology refers to the composition of the assemblage, including the number and variety of artifact types represented. Lastly, geomorphology refers to the geologic context of the site and whether the cultural material is in situ, has been redeposited, or has been affected by facility operations.

LANL-Specific Excavation-Project Research Designs, Data Recovery Plans, and Associated Comprehensive Agreements

In addition to the general archaeological research design described above, each individual excavation project will have a research design and data recovery plan that addresses those issues and questions pertinent to the sites and features being excavated. These research designs and data recovery plans are reviewed by the SHPO.

Along with the archaeological research designs and data recovery plans, comprehensive agreement(s) for intentional excavation under NAGPRA will be prepared for all culturally affiliated tribes.

Archaeological Baseline Studies

A series of baseline and specialized studies were prepared as part of the DOE LC&T Project final archaeological report (see Section 7). These studies will be used to develop general and specific archaeological research designs for future projects.

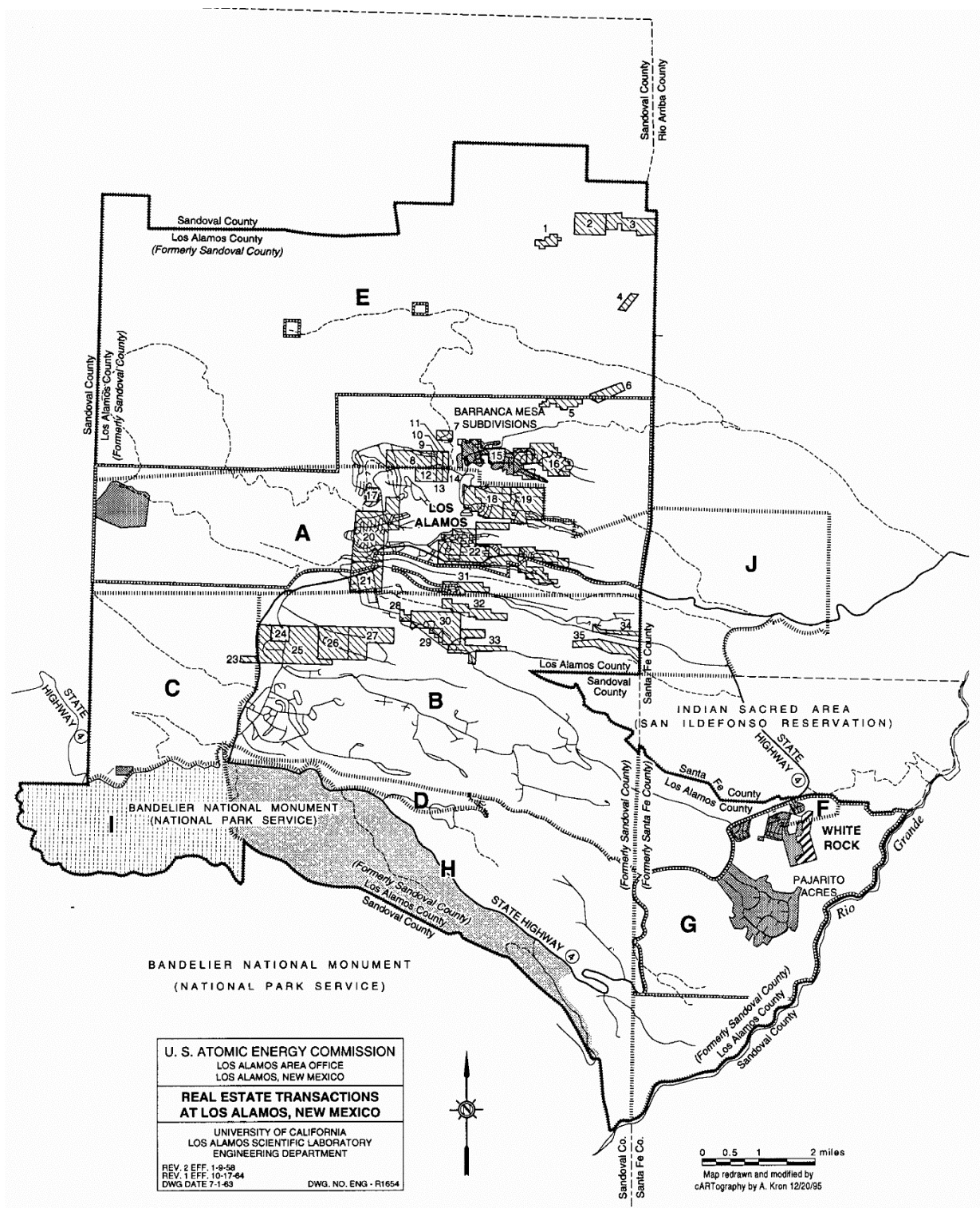
Homestead Context

LANS cultural resources staff prepared a context study focusing on the history of homesteading on the Pajarito Plateau in 2011 (Machen et al. 2011). This study presents homesteading on the Plateau within its national and regional contexts and describes the homestead families that successfully patented lands in the Los Alamos area under the terms of the Homestead Act and related federal land legislation. A map showing patented homestead locations at LANL is depicted in Figure 11.1. This context study, prepared in part to manage homesteading resources damaged during the May 2000 Cerro Grande fire (Nisengard et al. 2002), will be used to evaluate the significance of, and management recommendations for, the remaining homestead-era sites at LANL and will also be used to develop research designs for future projects related to these types of sites.

Archaeological Field-Survey and Site Recording Procedure (ENV-ES-QP-401, R3)

A procedure has been prepared to guide the conduct of archaeological survey and site recording at LANL, similar in scope and purpose to the building assessment process described in Section 10. The procedure covers both archaeological survey and site recording work and general safety considerations, and includes the following sections:

- Field Survey
 - Prefield Review
- Field Operations
- Survey Methods
- Cultural Resource Identification
 - Cultural Site
 - Isolated Occurrence
 - Initial Response and Notification - human remains
- Site Recording
 - Documentation
 - Eligibility Assessment
 - GIS Data
 - Sketch Maps
 - Infield Artifact Analysis
 - Photography
 - Records



**Figure 11.1. The County of Los Alamos and homestead patent locations
(numbered and hatched areas indicate homestead patents)**

Archaeological Excavation and Laboratory Processing Procedure (ENV-ES-QP-405.3)

Pre-fieldwork procedures include evaluations to assess geomorphic context and integrity; a series of recording forms used at LANL includes the following:

- Area definition form
- Area log
- Auger form
- Burial form
- Daily field journal
- Field specimen catalog
- Feature form
- Feature log
- GPS form
- Grid-level excavation form
- Instrument mapping form
- Room summary form
- Sample log
- Shovel test unit form
- Stratigraphy log
- Stratigraphy unit summary form

Field procedures explain the purpose and proper use of these forms. In addition, the field procedures manual describes techniques specific to each of the four main site types: artifact scatters, roomblocks, one- to three-room structures, and agricultural sites. The manual concludes with a statement on the Native American monitors who may be present during an excavation and refers the reader to the potential requirement to prepare an intentional excavation comprehensive agreement to satisfy NAGPRA.

General Laboratory Procedures

Laboratory procedures include the following elements:

- Checking in artifacts
- Washing
- Field specimen catalogs
- Computer databases
- Rebagging and creating new bags

- Photographs
- Flotation samples processing
- Human remains and NAGPRA items

As with the fieldwork, and as part of the general duties of laboratory personnel, a number of record logs are necessary for data tracking and for quality control. These include logs for processed flotation samples, a log listing bags or samples created in the laboratory (as opposed to field bags and samples), a daily log listing data conflicts and questions requiring consultation and resolution with field personnel, and logs to track human remains and NAGPRA-related grave associations and objects. An inventory and tracking system for all notebooks and accompanying paperwork that comes in from the field is also required.

Once artifact analyses and data recording are completed—including sketches and photographs as appropriate—artifacts are placed into appropriate containers for long-term curation at the Museum of Indian Arts and Culture, the designated DOE repository located in Santa Fe, New Mexico. Other duties performed by laboratory staff include the maintenance of field vehicle logs and the maintenance and updating of lists of vendors from which to purchase necessary field and laboratory supplies.

Human remains and other NAGPRA-related items are sometimes encountered during excavation projects at LANL and are initially processed in the laboratory. Under the terms of the NAGPRA intentional excavation comprehensive agreement for the LC&T Project, culturally affiliated tribes had the right to request a laboratory or in-field review of NAGPRA remains and objects at any time. Actual analyses of the human remains were performed by a qualified professional, and the human remains and other NAGPRA items were stored in a safe, clean, and secure area. NAGPRA remains and objects were repatriated to the culturally affiliated tribe after publication of a notice to repatriate was published in the Federal Register. Future intentional excavation comprehensive agreements will include similar provisions.

Part III. NHPA Compliance: Section 110

Section 12. Overview of NHPA Section 110

Section 110 of the NHPA sets out the broad historic preservation responsibilities of federal agencies and is intended to ensure that historic preservation is fully integrated into the ongoing programs of all federal agencies. It makes explicit the federal agency's responsibility for identifying and protecting historic properties. Section 110 also charges each federal agency with the responsibility for considering projects and programs that further the purposes of the NHPA, and it declares that the costs of preservation activities are eligible project costs in all undertakings conducted or assisted by a federal agency.

Additions to Section 110 of NHPA in 1992 set out specific benchmarks for federal agency preservation programs:

- Historic properties under the jurisdiction or control of the agency are to be managed and maintained in a way that considers the preservation of their historic, archaeological, architectural, and cultural values.
- Historic properties not under agency jurisdiction or control but potentially affected by agency actions are to be fully considered in agency planning.
- Agency preservation-related activities are to be carried out in consultation with other federal, state, and local agencies, Indian tribes, and the private sector.
- Agency procedures for compliance with Section 106 of the Act are to be consistent with regulations issued by the ACHP.
- An agency may not grant assistance or a license or permit to an applicant who damages or destroys historic property with the intent of avoiding the requirements of Section 106, unless specific circumstances warrant such assistance.

Seven specific standards for Section 110 were published in the Federal Register in April 24, 1998, along with recommendations for the implementation of these standards. These standards were developed with the recognition that the preservation and use of historic properties and their careful consideration in agency planning and decision-making are in the public interest, are consistent with the declaration of policy set forth in the NHPA, and must be a fundamental part of the mission of any federal agency. These standards and guidelines are intended to assist federal agency personnel and the agency head in carrying out their policies, programs, and projects in a manner consistent with the requirements and purposes of Section 110 of the NHPA, related statutory authorities, and existing regulations and guidance.

An agency should use these standards and guidelines, and consultation with the Secretary of the Interior and others, to ensure that the basic individual components of a preservation program called for in Section 110 are in place. The preservation program should also be fully integrated into both the general and specific operating procedures of the agency. The agency's preservation program should interact with the agency's management systems to ensure that historic preservation issues are considered in decision-making. One objective of the program is to ensure that the agency's officials, employees, contractors, and other responsible parties have sufficient

budgetary and personnel resources to identify, evaluate, nominate, manage, and use the historic properties under agency care or affected by agency actions.

These standards are listed below:

Standard 1. Each federal agency establishes and maintains a historic preservation program that is coordinated by a qualified Preservation Officer and that is consistent with and seeks to advance the purposes of the NHPA. The head of each federal agency is responsible for the preservation of historic properties owned or controlled by the agency.

Standard 2. An agency provides for the timely identification and evaluation of historic properties under agency jurisdiction or control and/or subject to effect by agency actions.

Standard 3. An agency nominates historic properties under the agency's jurisdiction or control to the Register.

Standard 4. An agency gives historic properties full consideration when planning or considering approval of any action that might affect such properties.

Standard 5. An agency consults with knowledgeable and concerned parties outside the agency about its historic preservation related activities.

Standard 6. An agency manages and maintains historic properties under its jurisdiction or control in a manner that considers the preservation of their historic, architectural, archaeological, and cultural values.

Standard 7. An agency gives priority to the use of historic properties to carry out agency missions.

Section 13. Cultural Resources Surveys at LANL

Approximately 90 percent of LANL has been systematically surveyed for archaeological resources. Figure 13.1 depicts the unsurveyed areas and divides them into nine separate parcels. In descending acreage these include a TA-70 parcel (1161 acres); a TA-33 parcel (784 acres); areas in and around TA-53 (320 acres); a parcel of Sandia and Mortandad Canyons (276 acres); a TA-68 parcel (222 acres); a parcel including portions of Pajarito and Two Mile Canyons along with Mesita del Buey (172 acres); a TA-71 parcel (142 acres); a combined TA-58 and TA-62 parcel (42 acres); and a TA-39 parcel (19 acres). Occasionally the LANS staff conducts archaeological surveys on adjacent federal, state, municipal, or tribal lands to support LANL initiatives. An example is a survey on lands belonging to the Pueblo de San Ildefonso for the placement of characterization wells. The 2014 MOA between the DOE/NNSA and the Pueblo de San Ildefonso defines the protocol for conducting work on Pueblo land. In 2015, the MOA was re-signed by the new Governor of the Pueblo de San Ildefonso.

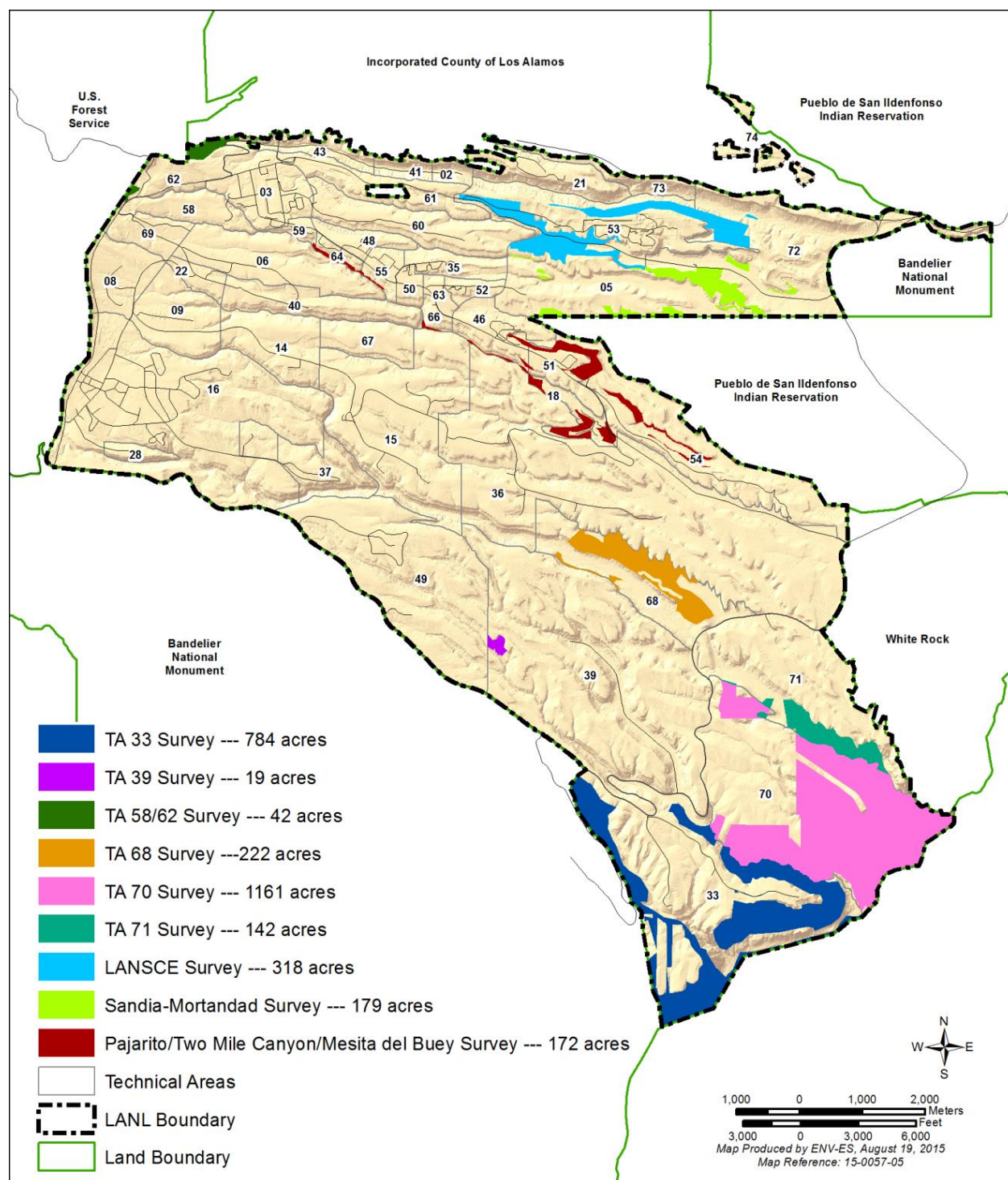


Figure 13.1. Unsurveyed areas at LANL

Section 14. Archaeological Collections and Laboratory-Era Equipment and Artifacts

In accordance with federal legislation 36 CFR Part 79, “Curation of Federally Owned and Administered Archaeological Collections,” artifacts, if not contaminated, are retained and curated at an appropriate facility, such as a museum. With five exceptions, all archaeological collections from LANL are curated at the Museum of Indian Arts and Culture.

The first exception includes collections made before the creation of the wartime Laboratory in 1943, which are housed at the Smithsonian Institution and other repositories. These earlier collections are outside of the federal legal mandate of DOE. The second exception is collections collected from federal land at LANL by the University of California at Los Angeles (UCLA) Pajarito Archaeological Research Project between 1977 and 1985. These collections are still housed at UCLA and the University of Arizona. The third exception includes field survey forms, maps, and other actively used records created during cultural-resources management activities on LANL property since the 1950s. These and a small number of exhibited artifacts and unprovenienced artifacts and other materials serving as teaching and comparative collections have been retained at LANL for use by members of the RMT. The fourth exception includes artifacts on display as part of the Environmental Research and Monitoring Exhibit at the Bradbury Science Museum in Los Alamos.

The fifth exception concerns post-1942 Laboratory artifacts. Scientific equipment and other artifacts associated with historically significant buildings and structures at LANL are identified, recorded, and occasionally removed before the demolition of a property (see Section 9). Such artifacts and equipment are typically evaluated and collected in conjunction with the DOE owned Bradbury Science Museum and are curated at LANL facilities managed by either the science museum or the RMT.

Section 15. Potential National Historic Landmarks at LANL

LANS staff completed a revision of the LASL NHL District that includes the addition of 17 LANL buildings and structures associated with the history of the Manhattan Project (Figure 15.1) (LANL 2012a). These properties are described below, along with a discussion of the recently authorized Manhattan Project National Historical Park, a unit of which is located at Los Alamos and includes the same properties, or some of the properties, included in the revised LASL NHL District. This section also describes several archaeological properties and Cold War–era buildings that have NHL-level significance. Section 16 describes site areas that should be considered National Register Archaeological Districts.

In 2004, Congressional legislation sponsored by Representative Doc Hastings and Senator Jeff Bingaman directed the NPS to examine historical areas associated with the Manhattan Project and make recommendations concerning the possibility of establishing a new national park (refer to the Manhattan Project National Historical Park Study Act or Public Law 108-340). The NPS issued its special resource study / environmental assessment in November 2009, in which several nonpark alternatives were identified along with an Alternative E that named Los Alamos as the only potential park unit. However, in response to public outcry from communities located in Washington state and Tennessee that felt their World War II properties had been given short shrift in the NPS review process, the November 2010, finding of no significant impact (FONSI) contained a revised Alternative E, with Los Alamos; Hanford,

Washington; and Oak Ridge, Tennessee each listed as park units (DOI 2012). The three areas were identified in the FONSI document as containing exceptionally significant historical properties that, when taken together, represented one of the most important events of the twentieth century. The FONSI stated that the park would be a DOI and DOE partnership, with continued DOE ownership and management of its historic properties. In addition to the FONSI's acknowledgement of joint agency responsibilities and the need for continued DOE ownership of its properties "behind the fence," the NPS would provide interpretation, education, and technical preservation assistance for properties at LANL.

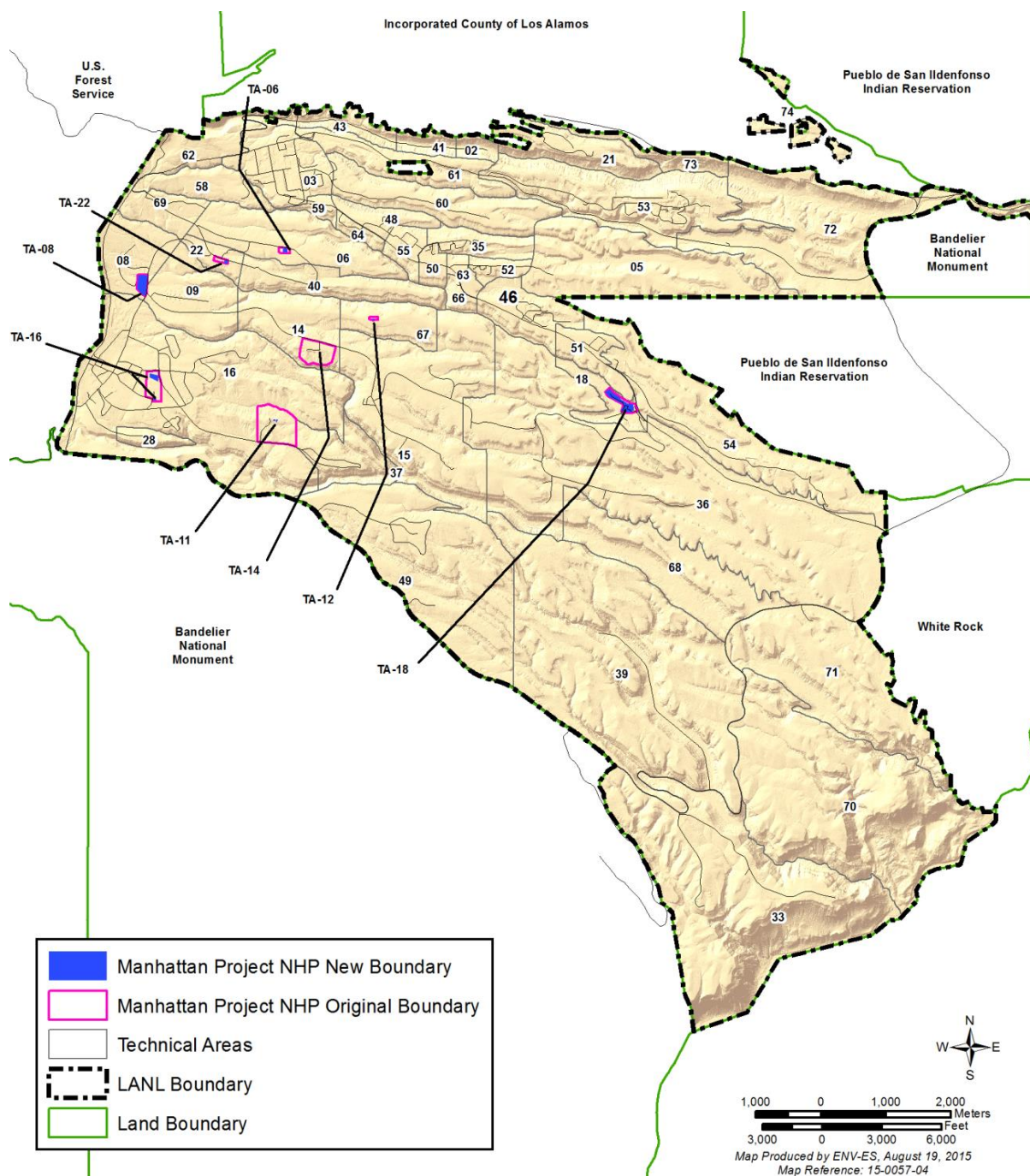


Figure 15.1. Revised LASL National Historic Landmark District

After the DOE's concurrence with the FONSI, Congressional members drafted the initial Manhattan Project National Historical Park legislation, and it was introduced to Congress (S. 3300) in June 2012. Specific park properties at Oak Ridge, Hanford, and Los Alamos were identified in the park legislation, including properties located in downtown Los Alamos associated with the Manhattan Project but built earlier as part of the Los Alamos Ranch School (circa 1921–1942). These included the Bathtub Row houses built for the school's instructors and for other school functions, the Ranch School's former powerhouse, and Fuller Lodge, now the town's most important community space. A former dormitory building and a former cafeteria built by the U.S. Army during the Manhattan Project and located in the downtown area were also included in the legislation.

At LANL, the 17 historic properties included in the revised LASL NHL document were referenced in the initial legislation. Located in eight separate areas (Figure 15.1), the potential park properties represent key events in the timeline of the Manhattan Project's scientific and engineering history and directly supported the design, assembly, testing, and use of the world's first atomic weapons, including the Trinity test device, the Little Boy weapon detonated over Hiroshima, and the Fat Man weapon detonated over Nagasaki (see Revised Los Alamos Scientific Laboratory NHL District below).

Reintroduced unsuccessfully in 2013, the park legislation was eventually signed by President Obama on December 19, 2014, as part of a public lands package included in the National Defense Authorization Act for Fiscal Year (FY) 2015 (S. 507 in March 2013 and H.R. 1208 in April 2013; H.R. 4435 and S. 2410, FY2015 NDAA; Senate-House Agreement H.R. 3979, December 2014). The Manhattan Project National Historical Park act stipulated that a year's grace period would be in effect before the park's formal establishment. This would allow for an MOA to be developed between the Secretary of the Interior and the Secretary of Energy, which would identify the initial DOE properties included in the park and establish key roles and responsibilities regarding enhanced public access, management, interpretation, and historic preservation. The MOA was signed November 10, 2015 by the Secretaries of Interior and Energy.

Manhattan Project National Historical Park—Eligible Properties at LANL

The Manhattan Project National Historical Park legislation, signed into law in December 2014, stipulates that eligible park properties may be added to the official park boundaries over time. Initial park properties and associated boundaries on land owned by the DOE were defined on a map published in the Federal after the signing of the MOA between the DOI and the DOE. Initial properties include nine individual buildings located at TA-08, TA-16 and TA-18. Other park-eligible properties may be included in the park at a later date. At LANL, eight properties listed in the revised NHL District document are considered park-eligible since they are listed in the final park legislation. Because of the potential for park-eligible properties to be included in the park in the future, all park-eligible properties will be maintained and managed to the same standards as those LANL properties that are officially part of the Manhattan Project National Historical Park. Public access considerations and park-related infrastructure improvements, however, will be planned and implemented only for LANL properties that are formally part of the Manhattan Project National Historical Park as indicated on the published park map available on the NPS's official park webpage.

Revised Los Alamos Scientific Laboratory NHL District

The LANL Historic District received NHL designation on December 21, 1965, for association with the World War II production of the first atomic bombs. The period listed was simply 1943. Because of security issues, the nomination's boundaries did not include any buildings within LANL; only buildings in the historic district of downtown Los Alamos were listed. These buildings included seven residences along Bathtub Row, Fuller Lodge, a powerhouse, and a small fire cache, all of which were originally part of the Los Alamos Ranch School (1917–1943). After the U.S. Army took over the Pajarito Plateau in northern New Mexico, where Los Alamos is located, the residences and Fuller Lodge became accommodations housing some of the people who came to work on the Manhattan Project's top-secret Project Y.

The original NHL nomination stated that “Although these structures [i.e., those in downtown Los Alamos] presently mark the extent of the Landmark it must be noted that the various technical areas and many of the experimental stations located elsewhere possess historical significance at the national level, but at this date [1965], the classified-restricted nature of these facilities prohibits the necessary surveying and researching to include them in the Landmark. Upon their declassification these properties should be studied for their inclusion in the Historic District” (NPS 1965).

The inclusion of historic Laboratory buildings has also been urged in the National Historic Landmarks Theme Study entitled *World War II & the American Home Front*. This document lists V-Site and Gun Site at Los Alamos as examples of signature properties that “appear to have strong associations with nationally significant topics within the World War II home front context.” The Assembly Building at V-Site was where the “gadget,” the plutonium implosion device tested at Trinity Site, New Mexico, on July 16, 1945, was partially put together before delivery to Trinity Site. The Gun Site and its related structures were used to test a different technique, the gun method, which was used to detonate the uranium bomb dropped on Hiroshima. The American Home Front study (NPS 2007) recommends “these properties be studied to determine their relative significance and integrity for possible NHL designation.”

The revised NHL nomination increases the size of the district by identifying and adding 17 buildings and structures on Laboratory property, including those at V-Site and Gun Site, which contribute significantly to the history of the scientific and technical work done at Los Alamos during World War II. These 17 sites are described below.

The Uranium Gun Bomb

The following buildings on Laboratory property represent the effort to design and develop the uranium gun bomb: TA-8-1 (laboratory and shop), TA-8-2 (shop and storage), TA-8-3 (laboratory), and TA-8-172 (portable guard shack).

TA-8-1**Original Function:** Laboratory and Shop **Date Constructed:** 1943**Current Function:** Vacant **Associated Theme:** Gun Device (Atomic Bomb)**Historical Significance:** Gun Device development and testing in support of Little Boy bomb.**Eligible?:** Yes – “A” and “C”

Description: TA-8-1 is the central structure of a group of three buildings located in the historic Anchor West or Gun Site area of TA-8. It is a cast-in-place, board-formed, concrete building with the south elevation earth sheltered into a modest hillside and berm. The roof structure is earth-covered concrete. The building is long and narrow with a covered dock and an enclosed dock area on the exposed north side. The finished floor level is elevated 3 ft above the driveway area. The enclosed dock area is wood framed with asbestos shingles and a sloped roof coincidental with the dock roof. The exterior doors are raised wood panel with two-over-two window lights. The only windows to the outside are the glass panes in the doors.

TA-8-2**Original Function:** Shop and Storage **Date Constructed:** 1943**Current Function:** Vacant **Associated Theme:** Gun Device (Atomic Bomb)**Historical Significance:** Gun Device development and testing in support of Little Boy bomb.**Eligible?:** Yes – “A” and “C”

Description: TA-8-2 is at the west end of the Gun Site complex. It is a cast-in-place, board-formed, concrete building. It is earth bermed on the southwest elevation, and the roof structure is earth covered with vegetation covering the area. A concrete retaining wall to the west connects to the building and creates the end of the drive pad in front of the group of buildings. Two double metal doors enter the building at ground level. The building is windowless. An exhaust ventilation duct is attached to the outside of the building. A unique feature of this building is the boat-tail (rounded) east elevation wall creating a robust appearance to the facility.

TA-8-3**Original Function:** Laboratory **Date Constructed:** 1943**Current Function:** Vacant **Associated Theme:** Gun Device (Atomic Bomb)**Historical Significance:** Gun Device development and testing in support of Little Boy bomb.**Eligible?:** Yes – “A” and “C”

Description: TA-8-3 is physically attached to the east end of building 8-1; an interior wall partitions the structures. The building is cast-in-place concrete with the original board formwork visible. It is earth sheltered on the south elevation, and the earth continues up onto the structure and creates an earthen roof, topped with vegetation. Entry into the building is on the north side

through a wood-framed vestibule attached to the concrete structure. A massive timber and earth-filled blast wall stands outside the entry. There are no windows except the light panel in the exterior door. A wood-framed stair leads up the east end of the building onto the dirt roof and provides access to steam utility manholes.

TA-8-172

Original Function: Guard Shack

Date Constructed: unknown (circa 1943 to 1950s)

Current Function: Vacant

Associated Theme: Security

Historical Significance: Representative of portable security facilities used at Gun Site in support of the development and testing of the Little Boy bomb.

Eligible?: Not yet evaluated

Description: TA-8-172 was designed to be a portable guard shack. Although its exact construction date and history is unknown, the building is representative of the type of portable security facilities that were commonly used during the Manhattan Project at Los Alamos. Wooden guard shacks built during the wartime years were moved from site to site depending on the security needs of the Laboratory. They were built on skids and did not have permanent utilities. The shacks were small, typically measuring 6-ft wide by 6-ft deep by 8-ft high, had heating stoves, and were often connected to nearby phone and electrical lines. Based on the few surviving drawings and historical photographs, there were several basic designs that included pitched-roof, flat-roof, and shed-roof styles. The shacks were typically clad with wood siding or asbestos shingles and were roofed with roll roofing.

Laboratory security guards used the shacks to protect themselves from the elements while stationed at designated security checkpoints. Portable guard shacks were in use at all technical areas of the Laboratory during the 1940s and 1950s; some guard shacks were moved and renumbered at least three times during their period of use. As permanent guard facilities were built after the war, the portable guard shacks were demolished or sent to salvage where they were purchased by the general public. Some guard shacks, like TA-8-172, were moved to private residences and reused as tool sheds. Others were converted for storage, like building TA-18-111, which was used by Bandelier National Monument to store horse tack.

The Plutonium Implosion Bomb

The following thirteen resources on Laboratory property represent the effort to design and develop an implosion bomb:

Assembly of the implosion device, the Gadget, tested at Trinity Site:

TA-16-58 HE Magazine

TA-16-516 V-Site Assembly Building

TA-16-517 V-Site

Development and testing of the first Fat Man bomb and related implosion and criticality research:

TA-6-37	Concrete Bowl
TA-11-1	Control Building
TA-11-2	Betatron Building
TA-11-3	Cloud Chamber Building
TA-12-4	Hexagonal Firing Pit
TA-14-6	Shop/Darkroom Building
TA-18-1	Slotin Building
TA-18-2	Battleship/Control Building
TA-18-29	Pond Cabin
TA-22-1	Assembly Building / Quonset Hut

TA-16-58

Original Function: Magazine

Date Constructed: 1944

Current Function: Vacant

Associated Theme: High Explosives

Historical Significance: Explosives process storage building in support of TA-16 activities.

Eligible?: Yes – “A”

Description: Building TA-16-58 is a one-story, single-room structure measuring 13 ft by 23 ft with an interior floor area of 210 ft². The structure was constructed with a reinforced concrete foundation, floor, and walls. The concrete walls were left exposed to approximately three-quarters of the height of the wall and then were covered with asbestos shingles over wood framing. A medium-pitched wood-framed gable roof with exposed rafter ends and rolled roofing covers the structure. Both gable ends contain metal louvers with screen transoms for ventilation. A lightning rod is located on the roof and grounded.

An earthen berm to three-quarters of the height of the walls surrounds the magazine on the south, west, and north sides. The east side was left exposed and contains double steel doors, the only access into the building. Square wooden posts and wood-plank wing walls extend out from the face of the east wall and are used as retaining walls for the earthen berm surrounding the building.

TA-16-516 and TA-16-517**Original Function:** Processing/Inspection **Date Constructed:** 1944**Current Function:** Vacant **Associated Themes:** Implosion / Gun Device / Trinity Test**Historical Significance:** Supported implosion gun, and Trinity device assembly and shake tests.**Eligible?:** Yes – “A”

Description: TA-16-516 is a wood-framed building with a concrete foundation and a flat roof. The building has a 16-ft ceiling with an overhead hoist mounted on an I-beam track. TA-16-516 is fairly small, approximately 570 ft² in size. A “kettle” platform and scale pit were added in the early 1950s. TA-16-517 is located next to TA-16-516. Like its adjacent building, TA-16-517 is of wood-framed construction with a concrete foundation and a flat roof. TA-16-517 is much smaller than TA-16-516, with an approximate floor area of 318 ft². An earthen barricade containing tie rods, cables, and log “deadmen” encloses the triangular-shaped building on two of three sides.

Building TA-16-517 was originally used as a processing/inspection building. It was later used as an equipment room for TA-16-516. The HE components for the Trinity device were assembled in TA-16-516 in the summer of 1945. Building TA-16-516 was later used for inert storage.

In 1999, the Laboratory submitted a Save America’s Treasures grant proposal, which was approved in early 2000. In May 2000, the Cerro Grande fire destroyed the majority of the historic buildings at V-Site. To restore the buildings that remained, the Laboratory worked with Benchmark Consulting Group to develop a stabilization and restoration plan. In 2005, the contract for restoration work was awarded to JB Henderson, with Crocker Ltd. as the preservation consultant. Restoration work began in December 2005 and major restoration activities were completed by June 2006 (Isaacson and McGehee 2007).

TA-6-37**Original Function:** Concrete Bowl **Date Constructed:** 1944 Experimental Area**Current Function:** Not in Use **Associated Theme:** Implosion (Atomic Bomb)**Historical Significance:** Plutonium recovery experiment in support of first implosion device.**Eligible?:** Yes – “A” and “C”

Description: TA-6-37 is a large concrete bowl constructed during the Manhattan Project for use as a scaled-down experimentation platform. The bowl consists of a sloping, ground-level concrete pad with a drain in the center of the structure. The concrete bowl is 200 ft in diameter; it was poured in 16 pie-shaped wedges. The center of the bowl has a raised dome with a metal cover on top. Near the north side of the bowl is a wood-framed and gravel-filled ramp (Figure 15.2).



Figure 15.2. Concrete bowl

The Manhattan Project scientists toyed with the idea of using a water-recovery method in which the bomb, surrounded by air space, would be suspended in a tank of water and fragments would be stopped by a 50 to 1 ratio of water to high-explosive mass. The feature was constructed for water-recovery tests in late 1944. The water-recovery shots used depleted uranium, and testing continued until the spring of 1945. Shake tests, probably of explosive assemblies, were also conducted in this structure in 1945. These included the “jumbinos,” or smaller versions of Jumbo (a huge steel containment vessel), within which the bomb would be exploded.

TA-11-1

Original Function: Control Laboratory

Date Constructed: 1944

Current Function: Storage Building

Associated Theme: Implosion

Historical Significance: Betatron diagnostic studies in support of spherical implosion research.

Eligible?: Yes – “A”

Description: Building TA-11-1 is one story in height and rectangular in plan. The structure measures 19 ft by 32 ft, 6 in., excluding the protruding wing walls. The single-room interior contains 480 ft² of floor space. The structure was constructed with board-formed heavily

reinforced concrete walls and flat roof and isolated floor. A compacted earth berm covers the north, east, and south sides and the roof of the building for added protection. A concrete entrance pad, an entry door, and an exhaust vent are located on the exposed west side of the building. The entry door is a steel-frame wood-plank door with heavy-duty strap hinges and a steel lever door handle. Reinforced concrete retaining walls with aluminum flashing, constructed perpendicular to the entry wall, angle down from the roof level of the structure to grade level.

The control room floor was constructed with reinforced concrete footings and a 10-in. reinforced concrete slab over a layer of sawdust, sand, and compacted earth. The walls and roof were also constructed of reinforced concrete and finished with two coats of dust-proof enamel. Floor trenches, measuring 8 in. by 12 in., were constructed into the concrete floor and lined with galvanized sheet metal. An isolated concrete pad, located in the northeast corner of the control room, supported the transformer.

TA-11-2 and TA-11-3

Original Function: Betatron and Cloud Chamber

Date Constructed: 1944

Current Function: Vacant

Associated Theme: Implosion

Historical Significance: Betatron diagnostic studies in support of spherical implosion research.

Eligible?: Yes – “A” and “C”

Description: TA-11-2 and TA-11-3 are two former laboratory buildings located back-to-back at K-Site. Both structures are one story in height and rectangular in plan, with a pointed end at the back of the building. The structures were constructed with a heavily reinforced concrete foundation over sawdust and sand layers, concrete walls, and a flat concrete roof. The sidewalls of both structures thicken from 1 ft to 3 ft along the length until they terminate at a point. A 16-in. outside-diameter steel pipe, located at the point, connects the two buildings together. Both the east and west sides and the roofs of the buildings are covered with compacted earth and a layer of asphalt, giving the appearance of a single reinforced structure. The interior of both buildings consists of a single open room constructed with a reinforced concrete floor, walls, and ceiling. Both rooms are equipped with surface-mounted conduit; heating, ventilation, and air conditioning ductwork; and light fixtures. A cable tray was used to house the numerous mechanical, electrical, and communication cables that spanned between the two structures.

Building TA-11-2 (Betatron): The entrance into the building is from the north side. The original steel-frame wood-plank entry door was set into the exposed concrete wall flanked by two reinforced concrete angled wing walls. In 1947, the entrance and wing walls into building TA-11-2 were enclosed and equipped with chain-link partitions. A new concrete floor was installed along with 2 in. by 4 in. stud walls and ½ in. gypsum board on the interior. A shed roof was constructed with 2 in. by 6 in. rafters and roofing concrete. The entrance was renovated and the exterior covered with square seam metal siding, and the roof was covered with rolled asphalt roofing material. The new entry door consists of a pair of metal doors set flush within the steel frame wall.

Building TA-11-3 (Cloud Chamber): Entry into the building is from the south side. The entrance consists of a steel-frame wood-plank entry door, with strap hinges and lever latch, set

into the exposed concrete wall and flanked by two reinforced concrete angled wing walls. A small toilet room is located adjacent to the entrance door on the exterior of the structure. A concrete roof extends over the entry area and is equipped with a steel observation tower accessed by steps on the southwest side. A 1-ton crane is suspended from a steel crossbeam.

TA-12-4**Original Function:** Firing Pit**Date Constructed:** 1945**Current Function:** Not in Use**Associated Theme:** Implosion/Recovery**Historical Significance:** HE testing in support of implosion (atomic bomb) research.**Eligible?:** Yes – “A”

Description: TA-12-4 is a hexagonal firing pit that was constructed of heavy timber for use in explosives testing and recovery experiments. The structure has 8-ft-wide sides and is 12 ft deep. The sides and top of the firing structure are lined with three-quarter in. steel plate. The structure stands alone with no supporting buildings and is situated on a human-made earthen mound. TA-12-4 was abandoned in 1953.

TA-14-6**Original Function:** Shop and Dark Room**Date Constructed:** 1944**Current Function:** Break Room / Storage**Associated Theme:** Implosion

Historical Significance: Small-scale implosion studies in support of implosion bomb development (“Fat Man”).

Eligible?: Yes – “A”

Description: TA-14-6 is a small, wood-frame building built on a concrete foundation and slab. The wood structure incorporates asphalt-impregnated paper with wood sleepers and asbestos shingles. The roof is wood frame, low slope with numerous layers of rolled roofing material. The north elevation shows three wood-framed, hopper-style windows with four-over-four window lights. The entry door is raised panel wood in a wood frame. Two double doors, which are modern replacements, are seen on two other elevations.

TA-18-1**Original Function:** Laboratory/Staging Area**Date Constructed:** 1946**Current Function:** Vacant**Associated Theme:** Implosion / Critical Assembly / Biomedical and Health Physics

Historical Significance: Laboratory work supported implosion testing and criticality research. Slotin accident led to important safety changes.

Eligible?: Yes – “A”

Description: TA-18-1 is one and a half stories tall on a small footprint and appears like a loft building (Figure 15.3). It is a wood-frame building with asphalt-impregnated paper and wood sleepers with asbestos shingles. The roof is basically flat with an 8-in.-high ridge in the center to provide runoff. A portion of the north elevation is sheathed with corrugated metal siding over the asbestos shingles. The floor slab is elevated to dock height, about 3 ft above the surrounding grade. The concrete stem wall is visible abovegrade. A concrete dock with access stairs, a double sliding door, and frame and rail for an overhead crane are in place at the south elevation. The windows are wood sash, double hung with three-over-three window lights and are situated on the east and west elevations only. The windows are set halfway up in the wall space.



Figure 15.3. Building 18-1, site of Louis Slotin criticality accident

TA-18-2

Original Function: Control Bunker / Battleship Bldg.

Date Constructed: 1944

Current Function: Vacant

Associated Theme: Implosion

Historical Significance: Supported tests of the magnetic method of studying implosions.

Eligible?: Yes – “A” and “C”

Description: TA-18-2 is a robust cast-in-place concrete building. The bunker is semi-recessed into the ground, and there are no openings other than a blast-resistant steel door on the east elevation. The sunken door is accessed down a concrete stair and stairwell. The roof is exposed concrete and no roofing material is apparent. TA-18-2 is also referred to as a “Battleship” building: the west end of the building is bow shaped and shielded with steel plate.

TA-18-29**Original Function:** Ranch Cabin**Date Constructed:** 1914**Current Function:** Vacant**Associated Theme:** Early Los Alamos (Pre-Lab) and Plutonium and Implosion Research

Historical Significance: Ashley Pond's office and library. It also served as a support building for fission and early implosion research.

Eligible?: Yes – "A"

Description: TA-18-29 is also known as the Pond Cabin. Built circa 1913 by Ashley Pond and first used as part of Pond's failed dude ranch, this building was later used to support early Manhattan Project research activities at Pajarito Site (TA-18). The cabin measures 16 ft by 24 ft with an 8-ft-high gable roof. The building occupies approximately 384 gross ft². The cabin is rustic in appearance with log walls and a corrugated-metal pitched roof. It has three fixed, three-over-three wood windows and one wood door, all of which appear to be original. One of the original window openings is boarded up. There is one indigenous stone fireplace and chimney. A round metal flue for a wood stove protrudes from the interior through the roof. There are no utility connections to this structure. The condition of the structure is fair, with the roof appearing to be in poor but appropriate condition (the building was stabilized in 1986–1987). Some of the metal roof panels have been replaced, but others are aged and rusted. Concrete barricades and sand bags surround the structure to divert the threat of flooding; these were placed around the building after the May 2000 Cerro Grande Fire.

TA-22-1**Original Function:** Assembly and Loading Building**Date Constructed:** 1945**Current Function:** Vacant**Associated Theme:** Implosion

Historical Significance: Explosive components for the "Fat Man" bomb were tested and assembled in TA-22-1.

Eligible?: Yes – "A"

Description: TA-22-1 is a true Quonset hut, often referred to as a Pacific-style hutment facility. It sits on a concrete foundation, which is visible at the stem wall level just below the metal siding. The building is covered with heavy gauge, corrugated siding arching over the frame. The siding has several coats of aluminized silver paint. Numerous steel casement windows line each side of the building. Because of the arch shape of the building, the windows rest at a slight angle. The windows are three-over-three, awning type windows. The east and west ends of the building have wood-frame additions, which serve as entrances to the building. The additions are covered with corrugated metal siding and have flat roofs.

During World War II, Los Alamos scientists assembled and tested explosive components for the world's second atomic implosion bomb in this building. The "Fat Man" bomb was detonated over Nagasaki, Japan, on August 9, 1945.

In 2011, LANL demolished two post-war additions located on the east and west ends of TA-22-1. This action was the first phase in restoring the Quonset hut to its original wartime appearance. The demolition project was undertaken in consultation with the New Mexico SHPO, who agreed that the building's greatest historical significance comes from its association with the assembly of the Fat Man weapon during the Manhattan Project (circa 1945).

Potential Ancestral Pueblo National Historic Landmarks

There are more than 1300 known Ancestral Pueblo archaeological sites at LANL, among the highest densities of such sites in the North American Southwest. While all are considered important by the modern Pueblo descendants of the people who made these sites, there are a small percentage of sites that, because of integrity of location and the nature of the resource, best serve to tell the story of the Ancestral Pueblo use of the Pajarito Plateau during the period of around AD 1250 to 1700.

These Ancestral Pueblo resources can be grouped into two general levels of significance: NHL potential status (Section 15) and National Register Archaeological District status (Section 16). A general description of these resources is provided below, followed by a specific listing of sites recommended for potential NHL status.

Late Coalition Period and Classic Period Complex Plaza Pueblos: During the period of around AD 1150 to 1250, large numbers of small single-story roomblock pueblos, each averaging around two to three habitation rooms and four to five storerooms, were constructed on the Pajarito Plateau. This represented the first time in the archaeological record that large numbers of people were living part or all of the year on the Plateau. Subsequently, during the period of AD 1250 to 1300, population began amalgamating into larger-sized pueblos. These pueblos appear to run from about 40 to more than 200 rooms and are characterized by two or more roomblocks being linked together around one or more partially or completely enclosed plazas. Most of these complex plaza pueblos contain one or more sections of roomblocks that were originally two stories in height, with the largest pueblos exhibiting evidence of three-story construction. Kiva ceremonial chambers, extensive midden areas, and cemeteries are also present. During the Classic period, after about AD 1325, the numerous complex plaza pueblos were consolidated into five immense pueblos, one of which is present at LANL (Tsirege).

Cavate Complexes: Associated primarily with late Coalition period and Classic period, complex plaza pueblos are a number of rooms excavated by hand into the welded tuff cliff faces. These range from small isolated habitation rooms and storage rooms to clusters of habitation rooms and associated storage rooms to clusters containing large square rooms that appear to have been used as kivas. The larger clusters almost invariably have one or more masonry rooms ("talus rooms") constructed immediately in front of the cavate rooms. Most cavate complexes also contain exterior rock art panels. The majority of cavate habitation rooms and cavate kivas appear to have been prepared by first smoking the room to produce a layer of black soot and then covering the lower third to half with a smooth layer of light brown plaster. This produces a seemingly purposeful effect possibly representative of the earth (brown) and sky (black). In the kivas and larger habitation rooms, petroglyphs are commonly scratched through the black soot, revealing the natural white tuff underneath, and somewhat less frequently through the brown plaster. Particularly in the kiva-like rooms, these petroglyphs are complex with many human and animal figures in scenes possibly representing myths or other narrative stories. There are three examples

of cavate complexes recommended for special status that include particularly rich examples of petroglyph narrative art and well-preserved room features.

Rock Art Panels: In many locations, the Pajarito Plateau canyon cliff faces exhibit petroglyphs that have been pecked into the welded tuff and basalt, most typically along southern and eastern exposures. There is a tendency for rock art panels to cluster near and within cavate complexes in the vicinity of complex plaza pueblos. The petroglyphs cover a wide range of styles and motifs, including human figures (such as masked and shield warriors), animals, plants, and geometric designs.

Masonry Circles with Upright Stones: Along the eastern tips of several mesa tops on the Pajarito Plateau, including at LANL, are isolated circles of shaped stone, including a number of elongated upright stones. The location of these features and informal discussion with individuals from the Pueblos of San Ildefonso and Santa Clara suggest these may have served as trail shrines.

Ancestral Pueblo Sites

Nake'muu Pueblo (30 acres): Nake'muu is a late Coalition period complex plaza pueblo and associated structures and trails situated on a narrow ridge between Water Canyon and Cañada del Buey. It is notable for its standing wall architecture, the only pueblo ruin at LANL with such walls, and the fact that it served as a refuge for people from the Pueblo de San Ildefonso during the late 17th century Pueblo Revolt. Photographs taken of the site in 1915 (Figure 15.4) reveal that there has been little change to the site during the past ten decades (Figure 15.5).



Figure 15.4. Nake'muu in 1915



Figure 15.5. Nake'muu in 2014

Tsirege Pueblo (57 acres): Tsirege is the only Classic period complex plaza pueblo at LANL and an ancestral village in the traditions of the Pueblo de San Ildefonso. Tsirege and Tsankawi were the last to be occupied on the Pajarito Plateau. It is one of the largest pueblo ruins on the Plateau and contains several hundred ground floor rooms and evidence of three-story architecture (Figures 15.6, 15.7, and 15.8). A long wall, approximately 10 kivas, a reservoir, and many significant rock art panels are also present. A major complex of associated cavate structures and talus rooms was constructed along the cliff face above the bottom of Pajarito Canyon. Tree-ring dates indicate use at least during the period of AD 1422 to 1580, with the later date coinciding with the final abandonment of the Pajarito Plateau by permanent Ancestral Pueblo populations because of prolonged drought.

Sandia Pueblo and Mortandad Cave Kiva complexes (43 acres): These complexes consist of complex pueblos associated with a series of rock art panels and cavates including several with petroglyph panels. These remains are included in the traditions of the Pueblo de San Ildefonso and may represent a place of special cultural and traditional value. Because of the large numbers of visitors to the site and concern over potential vandalism, the NPS assisted LANL in putting a protective steel grate around the entrance to the best-preserved and most elaborate cavate known as the Mortandad Cave Kiva (Figure 15.9), which remains locked except for periodic monitoring or official visits. This area was closed to the public in the 1970s because of concerns raised by the Pueblo de San Ildefonso.

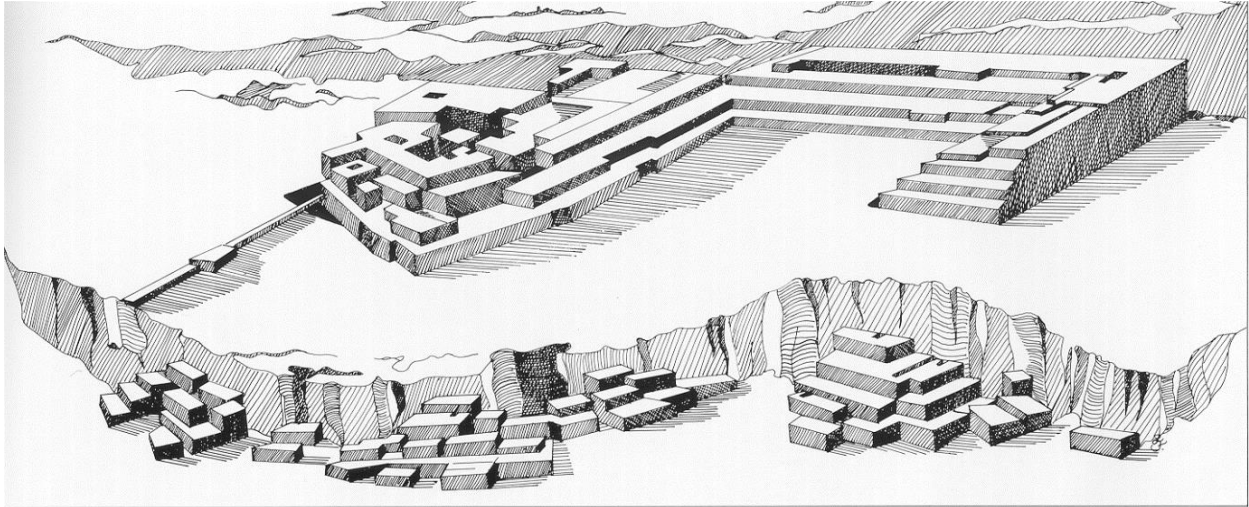


Figure 15.6. Artist rendering of Tsirege Pueblo (K.M. Chapman)



Figure 15.7. Aerial view of Tsirege Pueblo



Figure 15.8. Tsirege Pueblo



Figure 15.9. Steel grate in front of Mortandad Cave Kiva

Potential Cold War–era National Historic Landmarks

The following Cold War–era buildings and structures have currently been identified as Candidates for Preservation in Section 10 and were also listed in the 2011 update of “An Assessment of Historic Properties and Preservation Activities at the U.S. Department of Energy, in response to requirements of Executive Order 13287, Preserve America” (www.achp.gov/section3reports/2011/2011_Section_3_DOE.pdf). As additional significant Cold War-era buildings are identified, they may be added as Candidates for Preservation. The first four properties or groups of properties listed below are highly significant at the national level and are potential Cold War-era NHLs. The fifth set of properties (the historic “closed city” guard gates) may meet NHL standards because they represent not only the local story of Los Alamos as a Cold War town and laboratory but also the broader national themes of Cold War secrecy and security.

1. **TA-16-410, -411, -413, -414, & -415:** HE Assembly Building Complex (main building, rest houses, and corridors)

Significance: This assembly facility, built in 1951, supported LANL Cold War–era nuclear tests; it is an excellent example of HE processing facility architecture.

2. **TA-18-23:** Critical Assembly Building, Casa #1

Significance: This building, built in 1948, is the first remotely operated critical assembly facility; it was built in response to the 1946 Slotin accident at TA-18 (Pajarito Site).

3. **TA-41-1:** Underground Vault

Significance: This is the first “Q Area” vault; it supported early U.S. stockpile activities and was built in 1949.

4. **TA-60-17, -19:** Assembly Building and Rack Tower Complex

Significance: This is the only remaining LANL rack facility (it includes a multifloor rack tower and associated rack-assembly / cable-testing building); the facility supported underground testing at the Nevada Test Site and was built in the mid-1980s.

5. **Historic Guard Gates**

Significance: These Cold War–era public security check point / guard posts were built in the late 1940s (the “closed city” of Los Alamos opened its gates in 1957):

TA-16-1451 Back Gate Guard Station

TA-72-8 East Jemez Guard Station – “Sandia Gate”

TA-73-15 East Gate Guard Tower

6. **TA-18-26:** Hillside Vault (early Cold War)

Significance: This vault, built in the late 1940s, stored special nuclear material in support of criticality experiments at TA-18 (Pajarito Site).

7. TA-33-27: Cold War–era Guard House

Significance: This interior guard station was built and used during the Cold War. It was constructed in 1951 to serve as security access into TA-33 from New Mexico State Road 4 (NM 4). This building is significant to a larger, discontinuous Laboratory historic guard-house district.

8. TA-33-28: Cold War–era Water Tower

Significance: This Cold War–era water tower was constructed between 1949 and 1950. It supplied water for fire protection and potable water to TA-33 and TA-39. The water tower serves as a visible landmark that represents local Cold War–era architecture and is the only remaining elevated water tower from this era at the Laboratory.

Section 16. Potential National Register of Historic Places Archaeological Districts

In addition to the potential NHLs at LANL noted in Section 15, there are several archaeological site complexes and Cold War–era historic building complexes appropriate for designation as Register districts (Figure 16.1 and Figure 16.2). These sites are described below.

A historic district possesses a significant concentration, linkage, or continuity of archaeological sites or buildings united historically or aesthetically by plan or physical development. A district can reflect one principal activity or can encompass several interrelated activities. It can also be defined by archaeological sites or buildings of similar style and design. A district must be significant, as well as being an identifiable entity, usually meeting Criterion C as well as Criterion A, Criterion B, or Criterion D. As such, a district must be a definable geographic area that can be distinguished from surrounding properties of different age, scale, or style. Finally, a historic district must comprise contributing properties, which can be archaeological sites, buildings, or structures within the district's boundaries that reflect its significance, either because of historic association, architectural qualities, or archaeological features. Contributing properties should also have significant historic integrity (NPS 1990).

Mesita del Potrillo Complex (727 acres): A large complex of approximately 134 archaeological sites between Pajarito Canyon and Potrillo Canyon, immediately west of White Rock and south of TA-54. These sites include 4 complex plaza pueblos, 31 pueblo roomblocks, 26 cavates and sets of cavates, 19 rock art panels, 6 sets of stairs and trails, 21 one- to three-room structures, 4 lithic scatters, 3 rock shelters, 1 rock ring, 11 rock features, 4 artifact scatters, 3 garden plots, and 1 miscellaneous site. This complex is one of the densest and most well-preserved groups of Ancestral Pueblo archaeological sites at LANL. In addition, there are several parallel sets of wagon ruts on top of Mesita del Potrillo that may have been part of the transportation corridor servicing the timber-cutting activities of Henry Buckman, perhaps linking the Buckman sawmill to what was later to become S-Site (standing for sawmill site) at LANL.

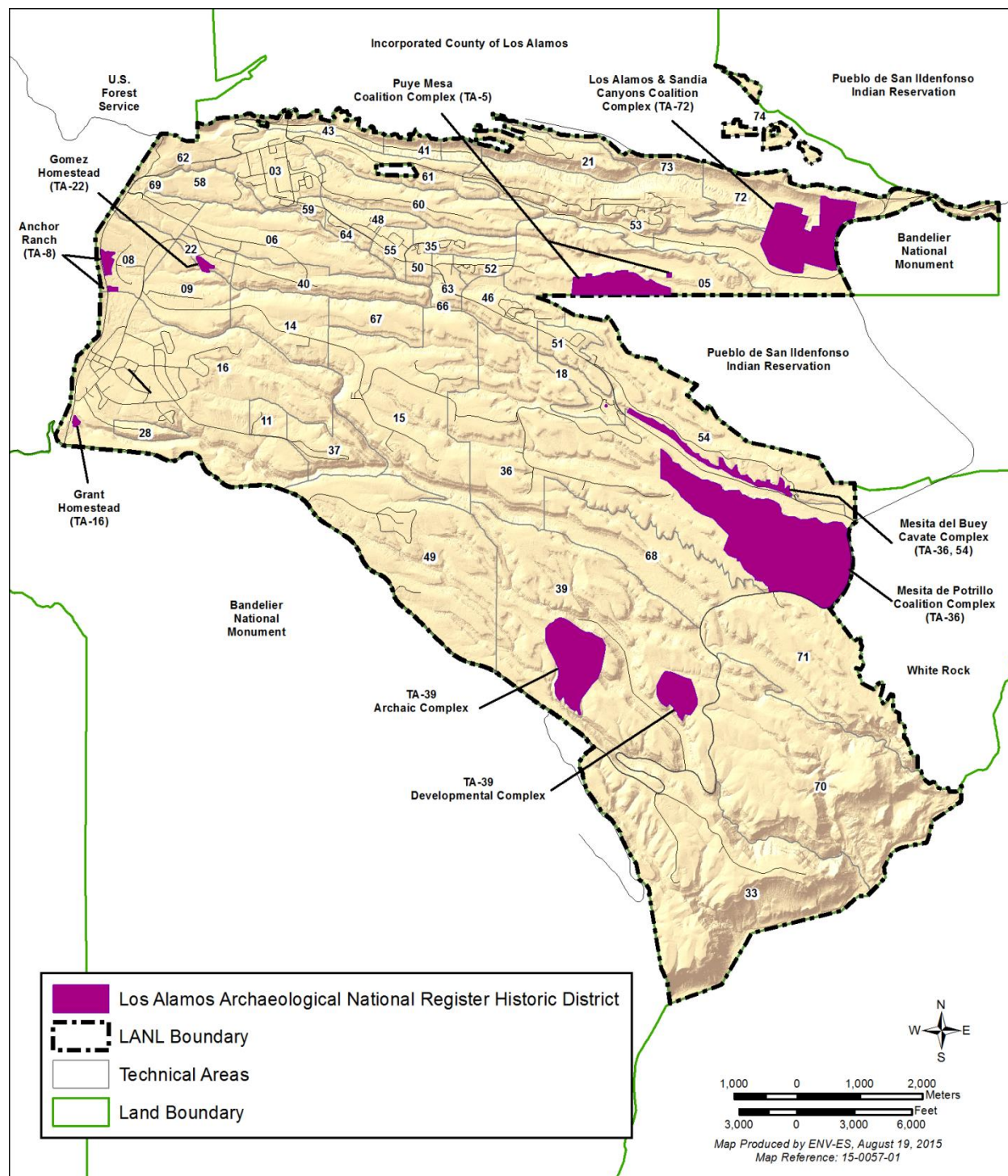


Figure 16.1. Potential archaeological national register historic district



Figure 16.2. Shaped tuff blocks from an Ancestral Pueblo roomblock on Puye Mesa

Los Alamos and Sandia Canyons Complex (277 acres): This is a complex of approximately 34 sites on either side of Los Alamos Canyon and north of Sandia Canyon, immediately west and north of NM 4. This complex includes a large Coalition-period complex plaza pueblo consisting of a series of 4 interconnected two-story pueblo roomblocks surrounded by single-story rooms, 4 pueblo roomblocks including a rare small Classic period pueblo, 15 individual cavates or cavate complexes, 3 lithic scatters, 3 lithic and ceramic scatters, 5 one- to three-room structures, 2 rock art sites, and numerous segments of trails and associated steps. The trail system likely serviced the occupants of nearby Tsankawi Pueblo in terms of travel from the Pueblo to the Jemez Mountains and the Valles Caldera to the west.

Puye Mesa Complex (108 acres): This is a complex of about 30 archaeological sites situated on the mesa top immediately south of Mortandad Canyon and immediately north of San Ildefonso lands. An isolated cavate along the northern slopes of Puye Mesa and an associated set of stairs are also included with this complex. The mesa top contains a dense cluster of sites including 2 complex plaza pueblos, 14 pueblo roomblocks (Figure 16.2), 6 one- to three-room structures, 4 Archaic-period lithic scatters, 1 lithic and ceramic scatter, and a probable reservoir and associated agricultural terraces. A historic wagon road also transects the area. A survey has not yet been conducted along a portion of the south side of the mesa immediately adjacent to the boundary with the Pueblo de San Ildefonso. The area will likely contain cavates, trails, stairs, rock art, and other possible features.

Mesita del Buey Cavate Complex (60 acres): This complex contains 21 sites, including outstanding examples of cavates and associated rock art situated along the southern cliff face of Mesita del Buey immediately north of the bottom of Pajarito Canyon (Figure 16.3). The area includes 13 cavate complexes, 5 rock art panels (Figure 16.4), and single examples each of a roomblock, rock shelter, and a lithic scatter.



Figure 16.3. General view of cavates along the southern cliff faces of Mesita del Buey



Figure 16.4. Petroglyphs on the southern cliff face of Mesita del Buey

TA-39 Archaic Complex (216 acres): This consists of approximately 19 archaeological sites situated on a mesa top between Water and Ancho Canyons in TA-39. The complex is distinguished by the presence of three large Archaic-period lithic scatters, one lithic and ceramic scatter with a predominance of Archaic-period materials, and three lithic scatters of undetermined affiliation, potentially including Archaic-period materials. In addition, there are several Ancestral Pueblo roomblocks within this complex.

TA-39 Developmental Complex (80 acres): This small complex contains a total of six archaeological sites. Based on ceramic analysis, two Ancestral Pueblo roomblocks and one lithic and ceramic scatter likely date to the Developmental period and thus constitute the earliest known Ancestral Pueblo archaeological sites on the Pajarito Plateau. The other three sites, likely dating to the Coalition period, include a one- to three-room structure, a lithic and ceramic scatter, and a rock feature.

Grant Homestead (4 acres). The Grant Homestead is situated on a bench in Water Canyon immediately east of NM 501. The homestead was established in the 1920s by an Anglo cowboy, Ted Mather, and his Hispanic wife, Rosa Grant, and was used up until the time of the Manhattan Project. Mather served as a wrangler with the Los Alamos Ranch School. The homestead was partially damaged by the Cerro Grande fire and subsequent rehabilitation measures. However, a number of features are still present, including the house and privy foundations, trash scatters, and other definable activity areas.

Anchor Ranch (14 acres). Anchor Ranch was established as a homestead in 1901 by James Loomis, an employee of the lumberman Henry Buckman. The Ross family of New York State purchased the homestead in 1924 and turned it into a small commercial cattle ranch. Francis Smithwick was hired to manage the ranch and to care for the Ross family's handicapped son, Alex. While none of the original ranch buildings are still standing (flooding after the May 2000 Cerro Grande fire destroyed an ice house), there are a large number of visible features extant, including two ponds, irrigation ditches, pumping apparatus, building and structure foundations, and trash deposits. One of the log guest houses, since demolished, was used for making the first industrial-type radiograph during the Manhattan Project. The Anchor Ranch name was used for Manhattan Project operations at TA-8 (Anchor Ranch West) and TA-9 (Anchor Ranch East).

Gomez Homestead (9 acres). The Gomez homestead is in TA-22 on the mesa edge immediately north of Pajarito Canyon near its junction with Starmers Gulch. It was established by Donaciano Gomez in 1899. The homestead was occupied by members of the Gomez family up until the Manhattan Project. Wooden structural elements of several features of the homestead were damaged or destroyed by the Cerro Grande fire. The homestead is largely unique in that a number of structures, including a corral, a possible guest house, lambing pens, a horno (Figure 16.5), and other features (Figure 16.6), were constructed of stone masonry. The integrity of the nearby Sanchez y Montoya homestead was largely destroyed by the fire, but relatively little damage was sustained at the Gomez homestead because of the prevalence of the stone masonry.



Figure 16.5. Gomez homestead horno



Figure 16.6. Other features at the Gomez homestead

Pond Cabin (1 acre). The Pond Cabin is the one surviving standing log structure at LANL dating to the Homestead period (Figure 16.7) and is listed on the New Mexico State Register of Cultural Properties. It was built in 1914 by Ashley Pond to serve as the office for the Pajarito Ranch, a commercial ranch similar in nature to Anchor Ranch. After the Pajarito Ranch was taken over by the Manhattan Project, the Pond Cabin was used as sleeping quarters for various employees working at TA-18. Because of the increased potential for flooding in Pajarito Canyon immediately after the May 2000 Cerro Grande fire, a series of cement road barriers and sandbags was placed around the structure to protect it in the event of flooding (see Section 22). No floods reached the Pond Cabin, and the barriers have since been removed.



Figure 16.7. The Pond Cabin at TA-18

Cold War Historic Building Complexes (552 acres). Los Alamos National Laboratory has two areas identified as historic districts located in TA-9 (Anchor Ranch Site East) and TA-16 (S-Site) and one discontinuous historic district of Cold War-era guard stations. The district in TA-9 consists of approximately 36 buildings, while the district in TA-16 consists of approximately 48 buildings (Figure 16.8). All of these buildings were constructed during the early Cold War (the 1950s and 1960s) to support the Laboratory's nuclear weapons development program. The facilities at TA-9 include laboratory/office buildings, processing and development buildings, and a security building (McGehee et al. 2005). Facilities at TA-16 have a larger range of use, including laboratory/office buildings, processing and development buildings, security and safety buildings, and a cafeteria (McGehee et al. 2003b).

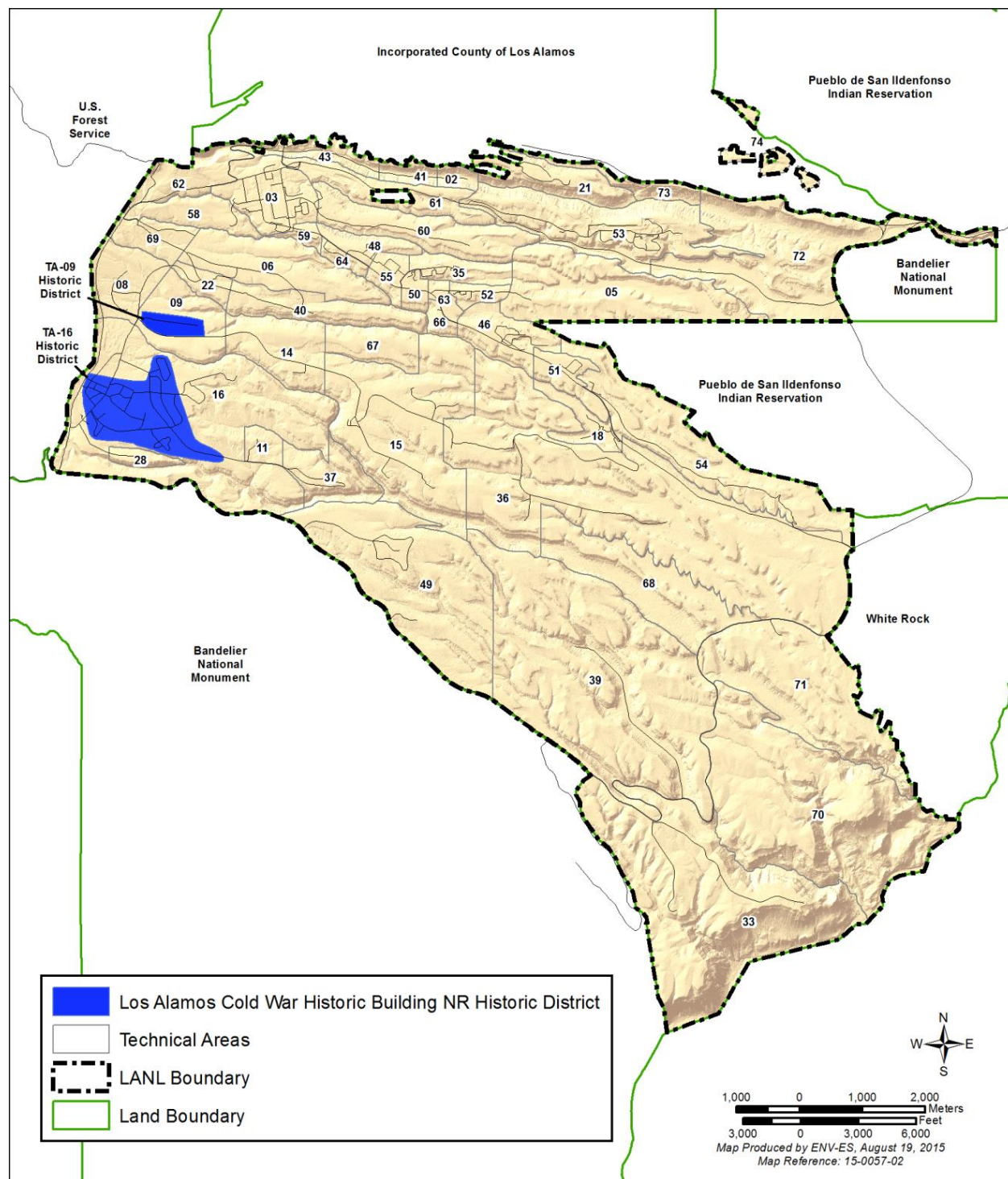


Figure 16.8. Potential Cold War–era historic districts at TA-16 and TA-9

These two districts are also identifiable from their buildings' architectural features. Most of these buildings are constructed of concrete with unpainted surfaces; all have flat roofs; most have their doors still painted with the original green color; windows if present are glass brick or single pane; and exterior lights if present are either hanging lights or half-round, wall-mounted, incandescent light fixtures. Some buildings in the TA-16 district also have loading docks with safety bumpers and nonsparking dock flooring. These architectural features identify these buildings as industrial vernacular scientific facilities, common military and scientific facilities built during the early Cold War (Figure 16.9).



Figure 16.9. Representative Cold War-era building located within TA-16 district

The discontinuous historic district at the Laboratory consists of the 12 remaining early Cold War-era guard stations, including the guard tower on NM 502 at the entrance into Los Alamos (Figures 16.10, 16.11, and 16.12). These buildings were all constructed between 1948 and 1959 and provided various levels of security. As with the other historic districts, these buildings are identifiable with distinct architectural features. The RMT has identified a typology of these guard stations that summarizes the buildings as follows: generally symmetrical or slightly rectangular in construction; constructed of concrete, wood, or stone; having flat or slightly pitched roofs; providing panoramic views with large windows; and located in areas primarily concerned with guarding the nuclear weapons research and design and stockpile support being conducted at LANL, as well as other identified historical missions, and controlling access into the “closed town” of Los Alamos (Garcia et al. 2015a).

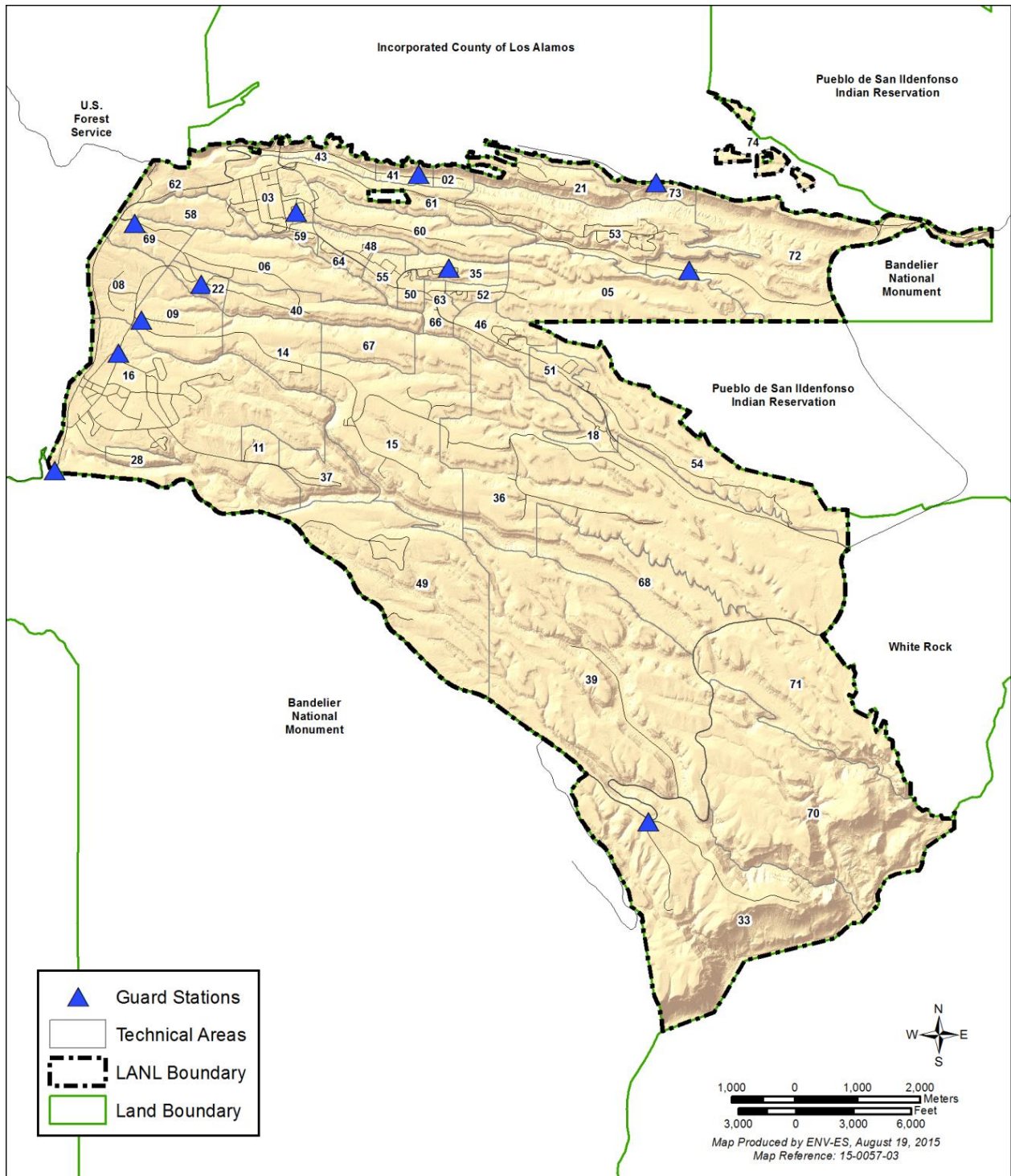


Figure 16.10. Potential Cold War-era guard-station discontinuous historic district



Figure 16.11. Representative Cold War-era guard station



Figure 16.12. Cold War-era front gate tower

Part IV. Native American Consultation and Outreach

Section 17. Native American Consultation

During the years that LANL has been in existence, it has attempted to maintain an amicable and respectful relationship with its Native American neighbors at the Pueblos of Cochiti, Jemez, San Ildefonso, and Santa Clara and with other tribes throughout northern and central New Mexico.

Laboratory historical activities have damaged and destroyed a number of Ancestral Pueblo archaeological sites and traditional use areas, especially during the early decades of LANL's existence before the passage of NHPA. Ongoing and planned future changes in DOE/NNSA missions and associated infrastructure upgrades will continue to have the potential to impact Ancestral Pueblo resources. Beginning in 1992, the Field Office and LANL made a concerted outreach effort on behalf of the Accord Pueblos. This effort resulted in a set of agreement documents with each pueblo that spelled out a series of issues and initiatives aimed at enhancing communication, supporting environmental monitoring, and providing for educational and employment opportunities.

In keeping with the spirit of these agreements and recognition of the dialog engendered during the past several years of cultural resources management at LANL, it is a goal of this CRMP to consider the concerns and wishes of the pueblos and other tribes while implementing LANL's national security mission. The 2014 MOA between DOE and the Pueblo de San Ildefonso defines how LANL work is to be conducted on Pueblo land and how the Pueblo will be notified of such work. The MOA was re-signed in 2015 by the new Governor of the Pueblo de San Ildefonso.

Cultural Affiliation

Historic preservation law, executive orders, and DOE policy require consultation with Native American tribes that are culturally affiliated with LANL. The tribes most directly involved in this consultation include the Pueblos of San Ildefonso, Cochiti, Santa Clara, and Jemez. The Jicarilla Apache are likely culturally affiliated with two tipi rock ring sites in Rendija Canyon excavated in 2003, which are part of the lands designated to be conveyed to the County of Los Alamos. To a lesser degree, the Pueblo of Acoma and the Mescalero Apache have expressed an interest in land-use issues at LANL. Based on oral traditions, Pawnee and Kiowa groups may have also made occasional forays into this general area but would not be considered culturally affiliated to the area.

Cultural affiliation as defined and intended under the canon of historic preservation law, particularly the NHPA and NAGPRA, differs from that definition upheld through the federal courts in relation to the Indian Lands Commission Act of 1946. For example, although the Pueblo de San Ildefonso claims aboriginal rights to all of the lands presently occupied by LANL (with the exception of the Fenton Hill parcel), it may be possible for other tribes to satisfactorily demonstrate the presence of TCPs or to demonstrate cultural affiliation to sets of human remains found in various locations at LANL. This situation highlights the fact that the regulatory standard for establishing cultural affiliation is a lower standard than that used to establish ancestral land claims. In June 2005, the Pueblo de San Ildefonso settled their claim under the Indian Lands

Commission Act, the last remaining tribe to reach settlement. However, this fact has not detracted from the clear understanding by DOE that most, if not all, of LANL (excluding Fenton Hill) is situated within the aboriginal boundary of the Pueblo de San Ildefonso.

The general tenets of Native American cultural affiliation are discussed in a 2007 assessment, “Determination of Ownership and Cultural Affiliation for Human Remains and Culturally Sensitive Objects Pursuant to the Native American Graves Protection and Repatriation Act (NAGPRA) at Los Alamos National Laboratory, New Mexico” (LANL 2007a).

The Pueblo de San Ildefonso is a direct neighbor to LANL, with several kilometers of shared boundary. San Ildefonso views much of the Laboratory as belonging within their ancestral boundaries and as their aboriginal land. DOE has researched this assessment and considers the Pueblo de San Ildefonso to be culturally affiliated under NAGPRA with Ancestral Pueblo remains throughout the Laboratory (Figures 17.1 and 17.2).

The Pueblo de Cochiti views the southern edge of LANL, including Ancho Canyon and the mesa top to the south, as being part of their ancestral boundaries; this pueblo thus appears to share Ancestral Pueblo cultural affiliation under NAGPRA for this part of the Laboratory with the Pueblo de San Ildefonso, a position evident in the review of historical documents and ethnographies.



Figure 17.1. San Ildefonso tribal members visit Nake'muu (2009)



Figure 17.2. San Ildefonso children's education visit (2015)

Santa Clara Pueblo (Figure 17.3) has stated a claim for cultural affiliation to Rendija Canyon, and possibly to other portions of the Laboratory, although the latter has not yet been formally presented to the Field Office as an actual claim. DOE has accepted the Rendija Canyon claim by the Santa Clara Pueblo. Therefore both Santa Clara and San Ildefonso are viewed as sharing cultural affiliation under NAGPRA to Ancestral Pueblo remains and objects in this particular location. DOE has not yet seen the evidence to support the notion that Santa Clara Pueblo is culturally affiliated to Ancestral Pueblo human remains elsewhere at LANL.

In addition to these three pueblos, DOE has determined that Jemez Pueblo has a cultural affiliation claim under NAGPRA for Ancestral Pueblo remains and objects at Fenton Hill. There is also the relationship of the Jicarilla Apache Nation to two historic tipi-ring sites excavated in 2003 in Rendija Canyon as part of the LC&T Project (Figure 17.4). The excavation evidence supports a connection with the Jicarilla Apache, but no human remains or NAGPRA-related items were recovered.



Figure 17.3. Santa Clara tribal members visit an Ancestral Pueblo site at LANL



Figure 17.4. Tribal consultation with the Jicarilla Apache

Other tribes who have shown an interest in LANL lands have included the Pueblo of Acoma, the Hopi Indian Tribe, and the Mescalero Apache Tribe. While the Pueblo of Acoma and the Mescalero Apache Tribe have expressed a desire to be kept informed of cultural resources actions at LANL, neither they nor the Hopi Tribe desire to be active participants in cultural resources consultations at LANL. Archaeological sites at LANL dating to the Archaic period (before AD 600) are considered too early for any one pueblo to have the knowledge to claim a direct lineal relationship with any human remains or potential NAGPRA-related objects. For this reason, in the unlikely event that any such remains or objects are found at LANL, cultural affiliation is assumed by DOE to be shared between all New Mexico pueblos and the Hopi Tribe of Arizona. Therefore, initial consultation would be performed with all of these tribes. However, the consultation process may determine that some or most of these tribes would be willing to formally defer consultation to the Accord Pueblos.

Native American Sovereignty and Government-to-Government Consultation

Executive Order 13175, along with virtually all historic preservation guidance and DOE policy, explicitly recognizes the sovereign status of federally recognized Native American tribes and therefore acknowledges that formal historic preservation consultation should be carried out on a government-to-government basis. This relationship is clearly spelled out in the DOE's October 2000 publication "American Indian & Alaska Native Tribal Government Policy" (DOE 2000b). Formal consultation regarding NAGPRA, NHPA, and other laws and EOs as may be appropriate, is conducted directly between the Manager or Cultural Resources Program Manager of the Field Office and the respective governors or presidents of pueblos and tribes. However, informal day-to-day conduct of cultural resources activities may also be carried out by appropriate staff, such as the Field Office Cultural Resources Program Manager, the LANS resources management staff, and various cultural resources and environmental program managers at the pueblos and tribes.

National Historic Preservation Act Section 106 Consultation

Consultation regarding Section 106 of the NHPA is carried out on a government-to-government basis between culturally affiliated tribes and DOE for all appropriate LANL undertakings. Typically, evidence of this consultation will be in the form of a memo and attached report provided to the SHPO by the Field Office, with copies to the tribes.

Traditional Cultural Properties

As noted in Section 2, a TCP, as established by the NHPA, is defined as a place of special heritage value to contemporary communities (often, but not necessarily, Native American groups) because of its association with the cultural practices or beliefs that are rooted in the histories of those communities and which is important in maintaining the cultural identity of the communities.

TCPs were first considered at LANL in the specific context of the 1993 then-proposed Bason Land Exchange in Rendija Canyon. Consultations by project staff with the Pueblo de San Ildefonso resulted in the identification and concurrence by the SHPO of seven TCPs associated with an ancient pilgrimage trail extending from the Rio Grande to a prominent peak in the Jemez Mountains.

The next set of TCP consultations occurred during the period of 1996 and 1997 during the preparation of an ethnographic study in conjunction with the 1999 SWEIS for LANL (DOE 1999). This undertaking resulted in contact with 16 tribes and members of nearby Hispanic communities.

The ethnographic study divided its classification of TCPs into five basic categories: ceremonial sites, natural features, ethnobotanical gathering sites, artisan material gathering sites, and traditional subsistence features. Tribes represented by the Pueblos of Acoma, Cochiti, Laguna, Picuris, Pojoaque, Sandia, San Ildefonso, Santa Clara, Zia, and Zuni indicated the use of TCPs from one or more of these categories on LANL land and/or with cultural affiliation to LANL land.

In 2000, the Field Office contacted 24 tribes to identify whether they had potential or known TCPs on LANL land. Along with the four Accord Pueblos, the Pueblo of Acoma and the Hopi Tribe responded affirmatively, as did the Mescalero Apache Tribe. Several tribes expressing cultural affiliation during the ethnographic study, those represented by the Pueblos of Laguna, Picuris, Pojoaque, Sandia, Zia, and Zuni, failed to respond despite several attempts to contact them. Of all of the pueblos, only San Ildefonso has recently provided specific information that can be adequately evaluated within the context of the law.

Executive Order 13007, Sacred Sites

Executive Order 13007 concerns Indian sacred sites. In order to protect and preserve Indian religious practices, federal land managers must accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and avoid adversely affecting the physical integrity of sacred sites (Section 2). Tribes view confidentiality of sacred sites in much the same manner as that of TCPs, with cultural resources information typically being closely guarded.

Native American Graves Protection and Repatriation Act

Compliance with NAGPRA at LANL is divided into three fundamental components. The first component, Native American tribes establishing potential cultural affiliation with LANL lands, was discussed above. The second component involves the development and use of NAGPRA intentional excavation comprehensive agreements for planned excavation at LANL. Such an agreement was produced in cooperation with the Pueblo de San Ildefonso and successfully used during the LC&T Project (Vierra and Schmidt 2008). As a result of the agreement, LANL was able to employ two monitors from the Pueblo de San Ildefonso. These monitors not only conducted their duties as NAGPRA monitors but participated as appropriate in aspects of excavation fieldwork, data analysis, and report production. Site monitoring was expanded in FY 2004 and FY 2005 to include a Santa Clara Pueblo monitor for excavations conducted in Rendija Canyon. The comprehensive agreement and the use of monitors was a tremendous success. The practice will continue in future excavations at LANL.

The third component is implementation of the standard operating procedure (SOP) for the inadvertent discovery of human remains or NAGPRA-related objects at LANL (LANL 2008). The SOP establishes a set of required procedures and time frames to be implemented in the event of an inadvertent discovery to ensure compliance with NAGPRA and all other applicable statutory and regulatory requirements. The SOP requires that any ground-disturbing activities within a 100-foot radius of the inadvertent discovery be halted or postponed while the site is protected and stabilized. The RMT leader or team archaeologists must be notified immediately,

and consultation with a qualified physical/forensic anthropologist may also be necessary. The site is evaluated and reported to the Field Office and the appropriate LANL managers. Language to this effect has been incorporated into the LANL project review process and into environment, safety, and health requirements that are applicable to subcontractors.

If the remains are determined to be Native American, the Field Office Cultural Resources Program Manager is responsible for government-to-government notifications to culturally affiliated Indian tribe(s) as detailed in the NAGPRA cultural affiliation study (LANL 2007a). The notification includes an invitation to participate in a field visit. The government-to-government inadvertent discovery consultation process includes a determination of the feasibility and practicability of in situ reburial for the remains and/or cultural objects. In the event that in situ reburial is not possible, then procedures that largely mirror those set up for the intentional excavation of Native American human remains and cultural objects during the LC&T Project are followed. Analysis of human remains conducted to facilitate identification of cultural affiliation is restricted to nondestructive methods and performed by a professional physical anthropologist. Unless otherwise agreed upon with the affiliated tribe(s), repatriation of the remains will take place. Project activities in the vicinity of the inadvertent discovery may resume if the planned site treatment is documented in written correspondence between the Field Office and the affiliated Indian tribe(s). This correspondence establishes a plan for either (1) stabilization and protection of the site with no removal of the human remains and cultural objects or (2) excavation or removal of the remains in accordance with 43 CFR 10.3 and their disposition to lineal descendants or Indian tribes with priority of custody as defined in 25 USC 3002(a) and 43 CFR 10.6. In consultation with Pueblo de San Ildefonso, the Field Office approved such a management plan in 2007 for a NAGPRA reburial site at LANL (LANL 2007b).

Native American Outreach

The Accord cooperative agreements between DOE/LANL and the Accord Pueblos (Pueblos of Cochiti, Jemez, San Ildefonso, and Santa Clara) initiated a period of dialog and support between and among these entities. The RMT continues outreach, collaboration, and cooperation with the Accord Pueblos.

In addition to field visits to archaeological sites and proposed sites for mission-related development, a number of cooperative endeavors have been undertaken, with many still in effect. The most notable ones are listed here (see also Section 20).

- **Nake'muu Monitoring Program** (1997 to present). A systematic study of effects of Laboratory operations and ambient environmental conditions on a unique 14th century standing-wall Ancestral Pueblo village was conducted with the Pueblos of San Ildefonso and Santa Clara between 1997 and 2006 (Nordby et al. 1998, Vierra and Schmidt 2006). Results from this study provided evidence to support the idea that there are no impacts to the site from Laboratory operations. Since 2006, the walls at Nake'muu have periodically been photographed as part of an annual site-monitoring program. Members of Pueblo de San Ildefonso are also invited annually for a site visit.
- **Cerro Grande Rehabilitation Project (CGRP)** (2002 to 2013). DOE contracted the Accord Pueblos to conduct tree thinning, snag removal, and erosion control on LANL land between 2002 and 2005 in aftermath of the May 2000 Cerro Grande fire

(Figure 17.5). During this period the Pueblos of San Ildefonso and Santa Clara also conducted assessments and rehabilitation activities at 118 Native American cultural sites damaged by the Cerro Grande fire. These sites were monitored and their condition reported in the Special Environmental Assessment (SEA) Mitigation Action Plan (MAP) annual reports and the SWEIS MAP annual reports. All sites have returned to pre-fire environmental conditions and are no longer subject to monitoring under the SEA.

- **Trails Working Group** (2004 to present). The RMT, as the lead for the LANS Trails Working Group, works closely with the Pueblos of San Ildefonso and Santa Clara to identify shared issues regarding public trail use in and around archaeological sites.
- **Tours of TA-5 Mortandad Cave Kiva Complex for the Pueblo de San Ildefonso** (2006 to present). In January 2006, the trail into the Mortandad Cave Kiva Complex was closed for unrestricted access by the general public (including LANS employees). The closure was prompted by concerns about vandalism and overuse of the resource because of the fragile nature and cultural sensitivity of some of the features. Since 2006, students from the Pueblo de San Ildefonso have visited the Mortandad Cave Kiva Complex, typically once a year accompanied by cultural resources specialists from the RMT (Figures 17.6a and 17.6b).
- **University House Traditional Cultural Property** (January 2007). In 2007, the Field Office approved a management plan for conducting work in this location with special relevance for the Pueblo de San Ildefonso (LANL 2007c). Implementation of this plan is ongoing.
- **Support for the Pueblo de San Ildefonso Youth Farm Program** (2008 to 2012). In 2008, the Pueblo de San Ildefonso initiated a Youth Farm Program. The explicit goals of this year-long hands-on experience were to revitalize traditional farming techniques, enhance cultural heritage, and to preserve the Tewa language. Members of the RMT and LANS students assisted the program by providing lectures (e.g., traditional Southwestern farming practices documented by archaeologists), workshops (e.g., local archaeological material culture), and archaeological site tours for Youth Farm Program students, and by participating in the Youth Farm Program field activities.
- **Bradbury Environmental Research and Monitoring Exhibit** (2014) In September 2014, the new Environmental Research and Monitoring exhibit opened to the public at the Bradbury Science Museum in Los Alamos. The exhibit features an overview of the cultural and biological management and compliance programs at LANL. Planning of this exhibit was done in consultation with the four Accord Pueblos. Specifically, the Field Office consulted with the Pueblo de San Ildefonso on a virtual tour of the Nake'muu pueblo, a recording dictating the correct pronunciations of the various large Classic-period pueblos on LANL property, and the overall exhibit. In addition, the Field Office consulted with the Governors from Santa Clara Pueblo and the Pueblo de Cochiti and with representatives from Jemez Pueblo.



Figure 17.5. Site rehabilitation efforts after the Cerro Grande fire



Figure 17.6a. 2009 Pueblo youth tour of Mortandad Cave Kiva Complex



Figure 17.6b. 2015 Pueblo youth tour of Mortandad Cave Kiva Complex

Part V. Strategic Planning and Long-Term Management Issues and Goals

Section 18. Cultural Resources Management and Strategic Planning

Cultural resources management at LANL is part of a larger set of planning activities that all have as their common goal the responsible use of the LANL built environment and landscape in support of the DOE/NNSA missions. With this in mind, it is imperative that this CRMP and its associated Road Map be closely integrated with all other planning initiatives and activities at LANL. Long-range planning initiatives at LANL are considered here. These include the Ten-Year Site Plan (TYSP), the SWEIS, the Site Sustainability Plan, Long-Term Strategy for Environmental Stewardship and Sustainability, footprint reduction planning, and other facility strategic plans.

Ten-Year Site Plan

The TYSP is a strategic planning document that is the foundation for the integration of real-property asset management. This document defines a path forward for the Laboratory to modernize, streamline, consolidate, and sustain its infrastructure to meet its national security mission (LANL 2015).

Goals of the FY 2015–2025 TYSP include

- constructed new facilities and reinvested in enduring facilities to support critical capabilities,
- completed projects to improve energy efficiency and long-term sustainability of resources,
- modernized utility infrastructure to support future programmatic needs,
- completed legacy cleanup and implemented Long-Term Strategy for Environmental Stewardship and Sustainability measures, and
- reduced overall footprint and consolidated nuclear infrastructure.

Some of the goals and associated projects have the potential to affect cultural resources and to be affected by cultural resources. The RMT supports the TYSP planning process by providing timely location assessments and site data to facilitate project planning and design. Additionally, the RMT prioritizes archaeological site and historic building evaluations and reevaluations in alignment with the TYSP path forward.

2008 Site-Wide Environmental Impact Statement

In 2008, DOE/NNSA released the most recent SWEIS (DOE 2008). This document recognized and stated that DOE/NNSA proposed to continue operations at LANL in support of its mission. The purpose of the SWEIS was to evaluate the potential environmental impacts of continuing to operate LANL and to receive and address comments from the public based on a draft of the document. The CRMP is part of the SWEIS MAP and is implemented as part of that compliance commitment.

The 2008 SWEIS and its two Records of Decision focus on the potential that these changes and enhancements may have on the physical environment, including cultural resources. LANS cultural-resources staff work closely with the individuals evaluating the operating parameters of the 2008 SWEIS to ensure cultural resources are fully evaluated as part of the overall LANL environmental policy compliance.

Long-Term Strategy for Environmental Stewardship and Sustainability Plan

In 2015, Field Office published the Long-Term Strategy for Environmental Stewardship and Sustainability plan (LANL 2012b). Over the next several decades, significant changes to the mission and operations at LANL are expected. The strategy commits to a progressively more sustainable site and a mission entwined with and accomplished by effective environmental stewardship. The plan provides a framework for thinking about the end states of current projects and programs and for envisioning what the Laboratory will look like in the long term.

Section 19. Prioritization Strategy for Register-Eligibility Evaluations of Archaeological Sites and Reevaluation of Sites

Many of the known archaeological sites at LANL have not been evaluated for eligibility to the Register. As of August 2015, 1072 of the known 1738 archaeological sites at LANL fall into this category. In addition, 556 archaeological sites previously determined to be eligible or determined to have an unknown eligibility for listing in the Register have either lost their integrity since their initial discovery and evaluation or were inadequately evaluated initially. All of these sites are considered eligible under the NHPA until definitive determinations can be made. One result of this situation is that strategic planners at LANL are restricted in their ability to place new facilities and infrastructure upgrades. A related problem is that funded projects are sometimes delayed while historic preservation consultations are conducted. It is in the best interest of the DOE/NNSA missions at LANL to deal proactively with these two related cultural-resources management issues in the following manner:

1. RMT staff will work with strategic planners to identify areas likely to be subject to development. This process is facilitated by the Decision Support Application (DSA), an interactive web-based GIS tool, which allows users to view 50-plus criteria at specific LANL locations to determine which criteria may have impacts on land use. These include the location and a significance ranking of archaeological sites and historic buildings. The DSA supports informed land-use decision-making and streamlined cultural resource management by identifying potential issues in the initial stages of project planning.
2. Once land-use areas are identified, they are prioritized by the anticipated date for project activities and by the size and location of project areas with respect to known archaeological sites. A similar effort focuses on the locations of historic buildings and structures. Areas of LANL not being actively considered for projects have low-priority status.
3. RMT staff will identify archaeological sites and historic buildings and structures within high-priority land-use modification areas that have not yet been evaluated for listing in the Register. Field checks will be necessary for some of these sites.

Section 20. Site Monitoring and Protection

An important aspect of cultural resources management is the field monitoring of significant cultural resources most vulnerable to impacts by vandalism, natural erosion or decay, or mission activities. Typically, most cultural resources eligible for listing in the Register are periodically monitored. The timing and level of monitoring effort depends on the fragility and sensitivity of the resource. Some resources require annual monitoring, while other resources can be adequately monitored every few years (specific monitoring priorities will be identified in a formal monitoring plan). The LANL site monitoring program will concentrate its efforts on three general site categories. The first is yearly monitoring devoted to examining a percentage of those archaeological sites and historic buildings and structures included in the proposed landmarks and national register districts described in Sections 15 and 16. The second category consists of important resources known to be moderately or severely impacted and compromised by ongoing erosion, recreational trail use, or other actively damaging situations. The third category consists of sites potentially threatened by infrastructure activities at LANL.

Site monitoring would include visual inspection to detect vandalism that has occurred since the last inspection, photography in selected locations to document condition changes, completion of a field monitoring form, and GPS recording of specific locations experiencing or subject to problems.

In addition to these general parameters for field monitoring at LANL, several significant monitoring efforts have been developed as the result of project-specific activities and programs. Examples are presented below.

SEA MAP Cultural Site Assessment, Rehabilitation, and Monitoring Project

In the aftermath of the May 2000 Cerro Grande fire, DOE contracted the Accord Pueblos to conduct tree thinning, snag removal, and erosion control on DOE-managed properties. As part of the overall CGRP, between 2002 and 2005, the Pueblos of San Ildefonso and Santa Clara worked closely with LANS cultural resources managers to conduct assessments at 118 Ancestral Pueblo cultural sites. These sites were damaged by the Cerro Grande fire and associated fire suppression activities or were threatened by the enhanced potential for damage from flooding during the summer monsoon season. In addition, some sites immediately adjacent to fire roads and fire breaks requiring periodic maintenance were identified for the construction of protective fencing. A total of 107 of these sites were selected for rehabilitation. The Pueblo de San Ildefonso began rehabilitation work starting in 2003, and this work was continued by Laboratory personnel after 2005. The primary purpose of this rehabilitation and associated monitoring was to attempt to restore, to the degree possible, these archaeological sites back to the conditions before the Cerro Grande fire.

Rehabilitation efforts at the Ancestral Pueblo sites included a variety of tasks, including felling and sectioning standing and fallen tree snags, hand-clearing or thinning vegetation and scattering slash for erosion control, constructing protective fences and annually repairing fences damaged by falling snags (Figure 20.1), placing straw wattles and sawn logs for erosion control (Figure 20.2), and re-seeding burned or heavily eroded areas with quick-growing seed of native grasses and shrubs.



Figure 20.1. Removal of tree fall and repair of site fencing (2011)



Figure 20.2. Erosion-control measures (2013)

Conditions at LANL returned to pre-fire hydrologic conditions in 2008, and subsequent work under the SEA MAP has been conducted to complete required rehabilitation actions. The FY 2013 SEA MAP annual report served as the final report related to archaeological site and historic building impacts resulting from the May 2000 Cerro Grande Fire and formally closed out all SEA MAP commitments related to LANL cultural resources affected by the fire (DOE 2013).

Along with this Ancestral Pueblo site effort, threatened or damaged Homestead-period and Manhattan Project resources were also assessed, followed by appropriate rehabilitation and associated monitoring. Rehabilitation has included the felling and removal of tree snags around historic structures and buildings, repair of damaged elements at V-site, analysis of long-term fire effects on homestead trash scatters, and erosion-control measures (Figure 20.3).



Figure 20.3. Erosion controls installed along the historic wagon road at the Montoya Homestead (2011)

These affected Ancestral Pueblo, Homestead period, and Manhattan Project sites have been monitored since initial assessment and rehabilitation, with specific site monitoring ceasing once the sites are determined to have returned to pre-Cerro Grande hydrologic conditions. This monitoring has been reported annually, initially through the SEA MAP annual report, and more recently through the SWEIS MAP annual report (Madsen and McGehee 2013). As of May 2015, all rehabilitation at the original 107 Ancestral Pueblo cultural sites selected for rehabilitation, and at two of the Homestead-period and Manhattan Project sites, is complete.

Mortandad Cave Kiva Complex Condition Assessment

The Mortandad Cave Kiva Complex located within Mortandad Canyon consists of over 150 cavates or rock-cut rooms, as well as associated rock art, stairways, and ancient trails. The site dates to the Ancestral Pueblo Late Coalition and Early Classic period (A.D. 1225–1350). In 2009–2010, the RMT conducted an assessment of cavates and associated features to establish a baseline from which to assess any changes in condition (Figure 20.4). A major focus of the assessment was to document the resources that could be susceptible to impacts from public site visitations (Johnson 2010a).



Figure 20.4. Archaeologist conducting the baseline condition assessment of cavates and related features at the Mortandad Cave Kiva Complex (2009)

The condition assessment generated a vulnerability ranking for the cavates (low, medium, high, critical). A critical ranking indicates that the civate has significant potential for deterioration resulting from human contact. Ninety-nine cavates and forty-four rock-cut rooms were assessed (several more were inaccessible because of safety concerns). Of the cavates, 15 were categorized as critical, 15 as high, 19 as medium, and 50 as low (Johnson and Hoagland 2010a). The assessment recommended that cavates ranked as “critical” be restricted from future public visitation and that cavates ranked as “high” be monitored (Figure 20.5). The vulnerability ranking restrictions have been implemented to eliminate public-visitation impacts to the fragile cavates and features. Additional assessment recommendations geared to protect the resources during public visitations include limiting tours to small, manageable groups; having a ratio of one RMT monitor to every five visitors; and requiring the use of predetermined tour routes.



Figure 20.5. High-priority cavate; note intact lintel, ventilation hole, and plaster (2009)

The goal of the Mortandad Cave Kiva Complex condition-assessment project is to monitor and potentially stabilize natural deterioration and to protect the resources from inadvertent human impacts while, at the same time, allowing the public an opportunity to learn about, appreciate, and enjoy one of the Pajarito Plateau's most unique and well-known cultural resources. To assist with this effort, a light detection and ranging (LIDAR) survey of the Mortandad Cave Kiva Complex was conducted in 2010.

Trails Working Group and LANS Coordination

The Trails Management Program at LANL and the Trails Working Group were established in December 2003 as part of the mitigations associated with the trails environmental assessment (DOE 2003) to inventory, map, and prepare historical reports on the many trails used at LANL. A major priority has been to strike a balance between the need for preservation and protection of cultural resources at LANL and the desire of Laboratory workers and the public to access undeveloped LANL lands for recreational use. The Trails Working Group includes representatives from the County of Los Alamos, the NPS, Santa Fe National Forest, local pueblos, and interested members of the community. The Trails Working Group coordinates with all interested parties to protect, preserve, rehabilitate, and manage trails and the cultural resources located in their vicinity.

In support of this undertaking, EPC-ES assessed the trail systems and nearby archaeological sites located in TA-70 and TA-71 and recommended forms of treatment to address trail and archaeological site impact and condition issues (Nisengard et al. 2006, Nisengard and Sherwood 2008, Nisengard 2008). Many of these treatment recommendations have since been implemented, including trail closures, trail reroutes (Figure 20.6), trail rehabilitation, archaeological-site erosion controls, and future monitoring (Johnson 2010b, Johnson and Hoagland 2010b). Between 2007 and 2013, the Trails Management Program hosted several volunteer work parties that provided an opportunity for groups and individuals to restore trails, an effort that resulted in preserving and protecting LANL cultural resources. A trails management plan is being prepared in order to provide continuing guidance for programming and budgeting trails work at LANL.



Figure 20.6. New section of trail being rerouted around an archaeological site

Nake'muu Pueblo Condition Assessment and Monitoring

In 1997, LANL commissioned the Mesa Verde Architectural Documentation Team of the NPS to perform a detailed condition assessment of Nake'muu Pueblo (Nordby et al. 1998). The timing of the assessment was triggered by the proposed construction of the Dual-Axis Radiographic Hydrodynamic Test (DARHT) facility on the north side of Cañon de Valle opposite to Nake'muu. The assessment study documented the condition of 272 walls at Nake'muu (a room typically has four walls). These walls were divided into four categories (Figure 20.7), with Category 1, standing walls, being the most fragile and Category 3 being the most stable. Most walls at Nake'muu are Category 4, which refers to collapsed walls not standing abovegrade. Thirteen Category 1 standing walls were identified, along with fifty-seven Category 2 walls and thirty-two Category 3 walls. The assessment results indicated that in 1998, 37.5 percent of the walls were standing to some degree. Of the 102 standing walls, approximately 13 percent were characterized as being in poor condition, 56 percent were in fair condition, and 31 percent were in good condition.

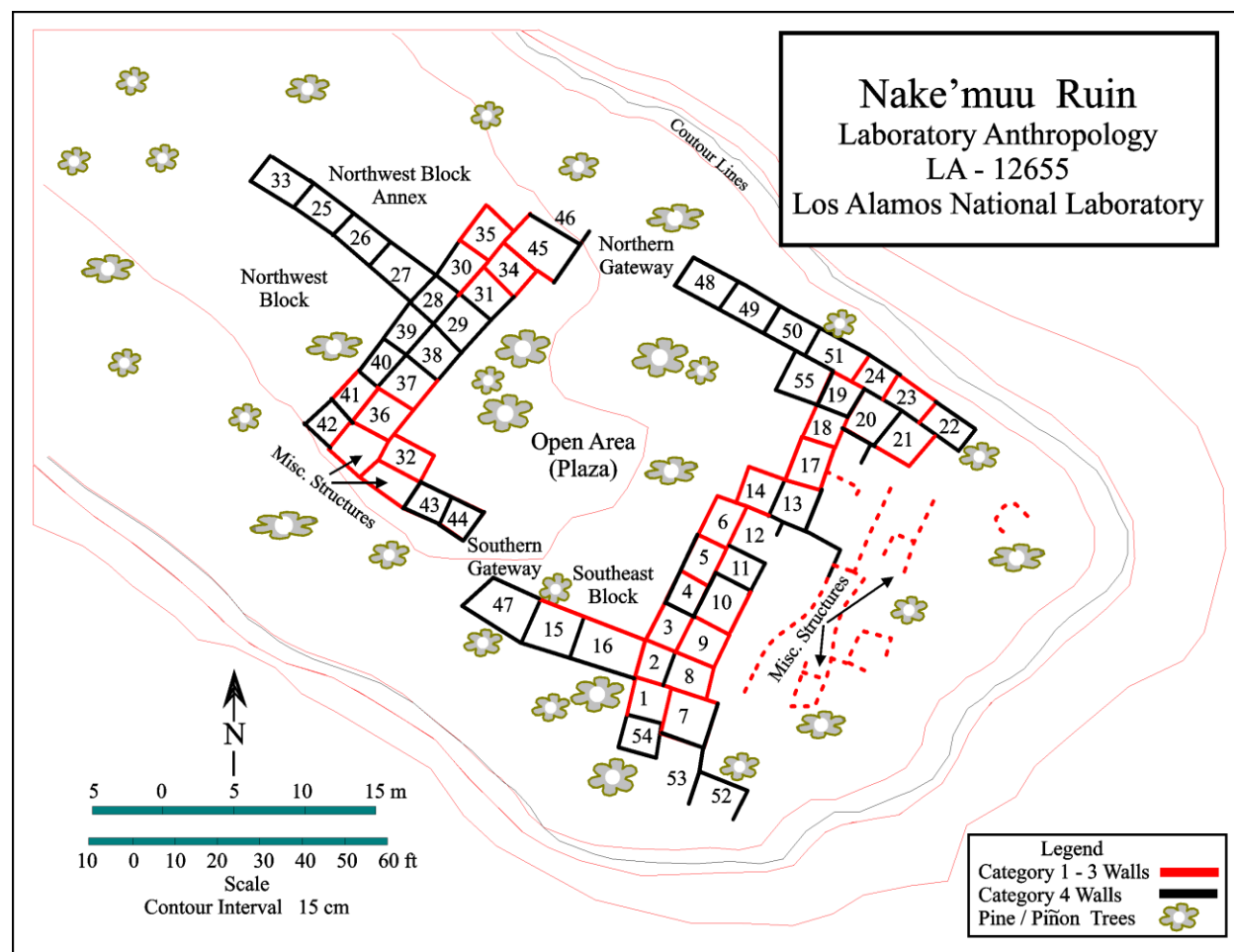


Figure 20.7. Map of Nake'muu prepared in 1997 by the condition assessment team

The RMT and pertinent LANS facility managers worked closely with the Pueblo de San Ildefonso to conduct a detailed annual inspection of Nake'muu Pueblo from 1998 to 2006 (Vierra and Schmidt 2006). The annual inspections systematically documented the loss of

architectural chinking stones (small pebble-sized fragments of tuff used in adobe mortar to help stabilize walls) and the displacement of masonry blocks from the standing walls. The 1997 condition-assessment wall profiles served as the basis for the yearly monitoring of chinking stone and masonry block loss. During the 9-year monitoring program, the site demonstrated a 0.9 percent loss of chinking stones and 0.3 percent displacement of masonry blocks. Statistical analyses indicate that these displacement rates correlated with annual snowfall and not with annual rainfall or explosive testing at the DARHT facility. One section of wall fall was attributed to disturbance by local migratory elk, which periodically include Nike'muu in their migration routes.

In the years following the 1998–2006 study, RMT staff have monitored and photographed wall conditions at the site (Figure 20.8). Monitoring is typically performed before the annual site visit by the Pueblo de San Ildefonso. Since 2006, there has been occasional minor displacement of masonry blocks, seemingly correlated with the years of greatest snowfall and freeze/thaw patterns. Currently, more than a dozen walls of individual rooms exhibit characteristics suggesting the potential for collapse within the next few decades. The Field Office is in consultation with the Pueblo de San Ildefonso and Bandelier National Monument to determine an appropriate course of action for the long-term management of this resource.



Figure 20.8. Annual assessment of Nike'muu walls by RMT staff (2015)

Following the original condition assessment, a 9-yr-long annual assessment of physical conditions at Nake'muu (1998–2006) was conducted, which led to the conclusion that the natural environment, in particular the amount of yearly snowfall and elk moving through the site, is responsible for the deterioration of the standing-wall architecture, not the operations at DARHT (Vierra and Schmidt 2006). Since 2007, yearly field checks and brief photographic assessments of the standing walls at Nake'muu continue to be conducted, documenting and noting the fall of stones from the upper courses of several walls and the general overall natural weathering and loss of some chinking stones and mortar. The most recent field check and photographic assessment was conducted in August 2015. Although eight tuff blocks total in two locations of the pueblo were noted to have fallen between 2013 and 2014, no new wall fall or damage was identified during the FY 2015 condition assessment.

In 2014, LANS and DOE worked to create a 3-dimensional virtual model of Nake'muu that supports education, outreach, and preservation questions. In consultation with the Pueblo de San Ildefonso, this model was converted into an iPad application, which is available to the public at the Bradbury Science Museum. In addition, the site can now “travel” to the Pueblo de San Ildefonso, where residents can visit the site virtually.

Section 21. Educational Outreach and Interpretation

Educational outreach and the dissemination of cultural-resources management information are important aspects of LANL's historic preservation program. The public is the ultimate beneficiary of NHPA documentation conducted by LANL, and, at times, individuals and groups can play a role in the Section 106 compliance process as interested parties. Outreach and interpretation activities include public tours (Figure 21.1), lectures, and museum exhibits, including the permanent Environmental Research and Monitoring exhibit, which opened in 2014 at the Bradbury Science Museum. Additional outreach includes publications, video productions, and publicly accessible cultural-resources management web pages with links to online compliance reports. An important aspect of the outreach program is to work closely with neighboring federal and municipal agencies toward common goals. For example, LANL has integrated treatment of historic trails and Homestead-era roads on LANL property with the County of Los Alamos's trails initiative, the County of Los Alamos Open Space Program Trail Network Plan. In a similar vein, LANS participation in the cultural resources subcommittee of the East Jemez Resource Council has benefited DOE and the cultural resources program at LANL. Planning efforts related to the recently established Manhattan Project National Historical Park unit in Los Alamos has necessitated a close relationship between LANS historic buildings staff, the County of Los Alamos, and the Los Alamos Historical Society. The creation of the park has also led to LANS and DOE coordination with community organizations and DOE staff from the Hanford and Oak Ridge site offices and with DOE headquarters in Washington, D.C.

In-reach activities that disseminate cultural-resources information to LANL are important because such information provides employees with an understanding of the place and origins of the Laboratory. Furthermore, educating current staff members about past scientific developments provides them with a greater awareness of their place within LANL's institutional history. Examples of in-reach activities include conducting employee and student tours (Figure 21.2) and preparing brief facility histories for use during site-specific new-hire orientations. At LANL, many exceptionally significant buildings and structures are located in areas normally closed to the public. Kiosks or interpretative monuments, such as the interpretive panels installed at TA-3 (Figure 21.3) and at TA-16 (V-Site) play an important in-reach function.



Figure 21.1. Tour of V-Site



Figure 21.2. LANL student tour of Mortandad Cave Kiva Complex



Figure 21.3. Interpretive panels describing historical LANL land-use at TA-3

Section 22. Procedures for Emergency Situations

The NHPA states that normal Section 106 review can be suspended during emergency work or repair work to minimize hazards to human health or to the environment or during declared disasters, emergencies, or national security threats. Such emergency actions will be immediately reported to the SHPO as conditions permit, and in a timely manner—normally within 1 month after the termination of the emergency—and impacts to historic properties will be evaluated and reported to the SHPO.

The LANL Emergency Operations Center (EOC) was established to deal with a variety of emergencies that may arise at or around LANL. For example, the EOC was the center of operations for dealing with the May 2000 Cerro Grande fire (Figure 22.1), and the EOC in its current location was the center of operations during the June 2011 Las Conchas fire. RMT staff members are part of the LANS presence at the EOC to ensure that environmental issues, including cultural heritage, are taken into account to the extent practicable during all emergency management activities. Members of the RMT have been trained to work at the EOC and to coordinate with the staff of the EOC. During emergency situations, cultural resource advisors are assigned to the EOC's Incident Command Team.

As demonstrated by the May 2000 Cerro Grande fire, emergencies and emergency response can have an impact on cultural resources. Of approximately 500 archaeological sites evaluated for fire damage during the 2 years following the Cerro Grande fire, more than 150 had some fire effects or fire-suppression damage (Figures 22.2 and 22.3). The fire also created special long-term problems, such as an enhanced potential for flooding because of the extreme burning of the upper watersheds of several canyons that flow onto Laboratory property. This led to some

innovative protection measures for canyon-bottom resources such as the Pond Cabin in Pajarito Canyon (Figure 22.4) (Nisengard et al. 2002).



Figure 22.1. Cerro Grande fire moving onto LANL land



Figure 22.2. Archaeological site damaged by the Cerro Grande fire



Figure 22.3. Nakemuu after the Cerro Grande fire



Figure 22.4. The Pond Cabin was enclosed to protect it from possible flash flooding after the Cerro Grande fire.

An important outcome of the fire assessment was the implementation of a series of rehabilitation measures at damaged or imperiled archaeological sites to help reduce the long-term effects of the fire and to reduce the likelihood that future fire suppression efforts would additionally damage the sites.

The Las Conchas Fire started June 26, 2011, and grew rapidly as a result of dry conditions and strong winds. In an effort to slow the progress of the fire and prevent it from entering Laboratory property and the townsite, LANS personnel conducted several fuels mitigation projects. The coordination between LANL's Emergency Management, Maintenance and Site Services, and the RMT was one of the success stories from the fire. Crews were deployed to several areas to complete fuels thinning and to improve existing fire roads and firebreaks. Crews used industrial-sized mowers and large-vegetation mulching machines known as masticators to reduce grasses, shrubs, and small trees to help prevent the spread of the fire (Figure 22.5). In consultation with the Field Office, LANS cultural resources staff were part of these crews. An RMT staff member was assigned to each crew and marked archaeological sites in areas scheduled for thinning so that they could be avoided and would not be impacted by these activities. Field assessments of the areas treated between June 26 and July 8, 2011, were conducted, and no impacts to cultural resources were identified.



Figure 22.5. Masticator clearing fire break near an archaeological site during the Las Conchas fire

Part VI. Safety, Security, and Quality Assurance

Section 23. Archaeological and Historic Preservation Fieldwork and Laboratory Safety and Security

Archaeological and historic preservation fieldwork performed at LANL is conducted in a safe and secure manner consistent with DOE and LANS policy and standards. Safety includes reading and understanding institutional safety philosophy and job-specific hazards analyses and safety plans. The key is an integrated safety-management approach in which every employee has the right and duty to perform work safely and to immediately question and report unsafe or potentially unsafe conditions. RMT staff, particularly supervisory personnel, are aware of and practice the five-step process in which (1) work is clearly defined, (2) the hazards are thoroughly evaluated, (3) controls to minimize or eliminate hazards are put into place, (4) the work is performed in a safe manner, and (5) the work performance is properly evaluated and safety improvements are put in place, if necessary, for future work.

Field safety measures include daily tailgate safety briefings (Figure 23.1). These measures also entail a series of integrated work documents (IWDs) prepared by project managers and specialists that define as pertinent and practicable all hazards associated with the specific job being done and provide procedures to minimize the hazards. All workers must sign these documents, and the field supervisor must take responsibility for ensuring that applicable IWDs are implemented.



Figure 23.1. A tailgate safety briefing takes place before fieldwork begins

In addition to the IWDs, there are a number of formal procedures that have been designed to ensure that all work conducted by the cultural resources program at LANL is conducted in a safe and efficient manner. The relevant procedures are listed in Section 25. Every LANS and DOE employee and subcontractor shares the responsibility to protect classified and unclassified controlled information. Archaeological and historic-preservation fieldwork often entails working in classified areas requiring escorts for uncleared personnel or working with archival documents that may contain classified or unclassified controlled information. A common example of the latter is that maps depicting archaeological-site location information are considered OUO and are not to be shared with the public. RMT staff members are trained in safeguards and security.

Section 24. Cultural Resources Management Administrative Record

A cultural resources management administrative record is kept on file at LANS. The administrative record currently contains documentation of all formal and some informal Native American consultation. It also contains documentation of all correspondence with regulators, including the New Mexico SHPO and the ACHP. Select formal correspondence between LANS and the Field Office is also maintained in the administrative record. LANS maintains records of public-outreach activities performed by cultural resources management staff members in support of cultural resources management at LANL. Records are maintained both electronically and in hardcopy paper form.

Section 25. Cultural Resources Management Quality Assurance Program

As a required aspect of LANL environmental programs, the cultural resources program operates under two quality assurance documents: the EPC-ES Quality Management Plan and a Cultural Resources Management Quality Assurance Program Plan. These plans ensure that programs and associated projects are carried out effectively and responsibly, with clear guidance maintaining quality control throughout project performance.

In addition to these two quality assurance documents, daily activities conducted by the cultural resources program are managed by several procedures. The following procedures encompass multiple activities, including project review, archaeological survey, excavation, archaeological laboratory work, data analysis, geographical and geospatial data management, historic buildings / structures fieldwork and documentary research, and the application of NHPA integrity and significance standards.

- ENV-DO-QP-100 General Field Safety
- ENV-DO-QP-104 Work Safety Reviews – Verification Low Hazard Activity Form
- ENV-DO-QP-120 Project Review Process
- ENV-ES-QAPP-CR.1, Quality Assurance Project Plan for Implementation of the Cultural Resource Management Plan
- ENV-EAQ-HB, R0 Quality Assurance Program Plan for the LANL Historic Buildings Project (part of the Cultural Resource Management Program)

- ENV-ES-QP-401, Survey and Site Recording
- ES-402, Field Visitors Tours
- ENV-ES-QP- 404, Construction Project Monitoring
- ENV-ES-QP-405, Archaeological Excavation and Laboratory Processing
- ENV-ES-QP-406, Historic Building Fieldwork
- ENV-ES-QP-407, Field Checks
- ES-412, Cultural Resources Project Review
- ENV-ES-QP-413, Native American Consultation
- EAQ-414, Cultural Resources Database Management
- ENV-ES-QP-415, Archaeological Resources Protection Act (ARPA) Violation
Discovery and Documentation

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Appendix A

10-Year Road Map for the Cultural Resources Management Plan

This 10-Year Road Map (Road Map) for the Cultural Resources Management Plan (CRMP) represents a prioritization of the efforts necessary to achieve the goals of the CRMP. These goals include cost-effective and efficient long-term management strategies for the protection of significant heritage resources at Los Alamos National Laboratory (LANL). The Road Map also provides an aggressive approach to enhancing land-use flexibility at LANL. The Road Map will be reviewed annually and updated as necessary. The Road Map has identified tasks to be completed between fiscal years (FYs) 2016 and 2026. These tasks are divided into two groups. The first group of priorities (1–12) represents short-term projects, intended to address specific resource issues. The second group of tasks is programmatic activities intended to take place throughout the life of the CRMP and its subsequent iterations and which provide the minimum effort required to successfully implement the Road Map. An example of programmatic activities would be the yearly monitoring of potential National Historic Landmark (NHL) and National Register of Historic Places (Register) District properties.

Short-Term Priorities and Goals

Priority 1. Key Development Area Studies

The Los Alamos National Security, LLC (LANS) Resources Management Team (RMT) can use institutional planning information and tools (e.g., Ten-Year Site Plan, Site-Wide Environmental Impact Statement, Long-Term Strategy for Environmental Stewardship and Sustainability) to identify areas of the Laboratory that will be developed and prepare a study with recommendations for cultural-resource-management actions to be taken in the next 1 to 3 years (e.g., identify unsurveyed areas, identify creative mitigation strategies).

Priority 2. Support the Manhattan Project National Historical Park

The RMT will support the United States Department of Energy / National Nuclear Security Administration Los Alamos Field Office (DOE/NNSA Field Office) and the National Park Service (NPS) on the implementation of the Manhattan Project National Historical Park. Restoration, repairs and stabilization of buildings within Technical Area (TA) 18, TA-16, and TA-8 are necessary.

Buildings within TA-18 include Pond Cabin (TA-18-29), Slotin Building (TA-18-1), and Battleship Bunker (TA-18-2). In addition to building repairs and maintenance, the TA-18 area will undergo landscaping and sidewalk and road repairs. Interpretive panels and displays will also be installed in and around these buildings.

Buildings within TA-16 include V-Site (TA-16-516 and -517). Although restoration efforts have been completed and interpretive panels have been installed, maintenance of the buildings and features will continue.

Buildings within TA-8 include Gun Site (TA-8-1, -2, -3 and -172). Stabilization of the concrete on the parapet and docks has been completed; noncontributing elements (non-Manhattan Project period) have been removed from the buildings. Additional restoration activities may include reconstruction of the periscope and one gun emplacement structure. Interpretive panels will be installed in and around the buildings. The Guard Shack (TA-8-172) will be restored and placed in an appropriate historic location within proximity of the Gun Site buildings.

Priority 3. The Field Office will reach a resolution / path forward for Nake'muu.

Priority 4. The Field Office will reach a resolution / path forward for University House.

Priority 5. The RMT will implement a modified annual cultural resources monitoring plan, with a focus on the most significant archaeological resources at LANL as appropriate (See Programmatic Task A below).

Priority 6. Significance Evaluation Criteria for Archaeological Sites

The DOE will develop a set of criteria that will help standardize the process for evaluating the significance of archaeological sites throughout LANL in terms of the sites' eligibility for listing in the Register. Using research findings from LANL survey and excavation projects (e.g., the Land Conveyance and Transfer [LC&T] Project), the RMT will determine archaeological site significance using a weighted scale, which will include site integrity and site significance. The intent of this task is to streamline part of the effort necessary to process the current backlog of archaeological sites that have not yet been evaluated for the Register.

Priority 7. Legacy Closeout Reporting: ER Project Report Completion and SHPO Consultation

Complete archaeological survey reports and subsequent consultation with the State Historic Preservation Officer (SHPO) for environmental compliance projects dating between 1991 and 1995. These projects were part of the LANL Environmental Restoration (ER) Project study conducted throughout LANL. LANL is now undertaking a streamlined approach to report completion. Completion of these reports will help facilitate the project-review process for new construction and other infrastructure projects at LANL. In 2015, LANS cultural resources staff completed report ER 1085. The report provided eligibility assessments for eight archaeological sites.

Priority 8. CGRP Archaeological Site Recording

Complete recording of 447 archaeological sites discovered on previously unsurveyed lands at LANL during tree-thinning operations between FY 2001 and FY 2004 as part of the Cerro Grande Rehabilitation Project (CGRP). In order to permit the timely completion of CGRP tree-thinning activities, LANL was under formal agreement with the SHPO that these sites could be marked for avoidance but would not be recorded until the conclusion of CGRP activities. Completion of these records and submittal to SHPO and Archaeological Resources Management System is a critical compliance issue and will facilitate and streamline the new project-review process for new construction and other infrastructure projects at LANL. As of 2015, recording of 160 of the 447 archaeological sites has been completed, and the associated forms have been submitted to the SHPO.

Priority 9. Historic Buildings Register Evaluations

A formal review has not yet been performed for approximately 100 early Cold War (1946–1963) buildings and structures, along with a few exceptionally significant recent buildings and structures that have been identified as potentially eligible for the Register. Short-term evaluation priorities should be determined using institutional planning documents.

Priority 10. National Register Nominations (Ancestral Pueblo Sites)

Prepare National Register nominations for these Ancestral Pueblo properties:

- **Mortandad–Sandia Complex** (Mortandad Cave Kiva complex; Sandia Cave Kiva complex; Sandia Pueblo).
- **Nake'muu.** Complete the Pueblo consultation process. Recommendation is to go forward with a Register nomination regardless of consultation results. The consultation will mainly be concerned with issues of stabilization, treatment, and education.
- **Tsirege.** Conduct baseline survey and boundary assessment, including associated grid gardens, reservoir, talus rooms (in addition to cavates), and nearby sites that might be included as part of the complex.

Priority 11. Archaeological Surveys and Reporting

Survey the following areas as needed or annually as recommended, based on future development plans.

- **Pajarito and Twomile Canyons and Mesita del Buey.** Systematic archaeological inventory survey has not been previously conducted for approximately 172 acres in Pajarito and Twomile Canyons and on portions of Mesita del Buey in TA-54.
- **TA-58 and TA-62.** Systematic archaeological inventory survey has not been previously conducted for portions of TA-58 and TA-62. The unsurveyed area contains approximately 42 acres immediately west and south of TA-3.
- **Sandia Cave Kiva, Sandia Pueblo, and Mortandad Cave Kiva Complex.** Complete the systematic archaeological inventory survey of the Sandia Cave Kiva, Sandia Pueblo, and Mortandad Cave Kiva Complex. Approximately 179 acres are unsurveyed.
- **LANSCE and TA-72.** Complete the systematic archaeological inventory survey for approximately 318 acres in the vicinity of the Los Alamos Neutron Science Center (LANSCE) (plus acreage for TA-72).
- **TA-33.** Complete systematic archaeological inventory survey for approximately 784 acres in TA-33.
- **TA-39.** Complete systematic archaeological inventory survey for approximately 19 acres in TA-39.
- **TA-68.** Complete systematic archaeological inventory survey for approximately 222 acres in TA-68.
- **TA-70.** Complete systematic archaeological inventory survey for approximately 1161 acres in TA-70.
- **TA-71.** Complete systematic archaeological inventory survey for approximately 142 acres in TA-71.

Priority 12. Modeling and Testing Artifact Scatters for Subsurface Integrity

This task consists of developing a set of geomorphic criteria to categorize the likely integrity of archaeological sites and thus their suitability for listing in the Register. Sites located on geomorphically unstable surfaces like alluvial fans or floodplains are probably the result of erosion and are not in their original primary context. The intent of this task, like that of Task 6, is to streamline part of the effort necessary to process the current backlog of archaeological sites that have not yet been evaluated for the Register. However, this task entails looking at a number of artifact scatters previously deemed eligible for the Register, but which likely now lack sufficient integrity to qualify for listing. This task will involve using aspects of the cultural resources program Graphic Information System (GIS) to look at the spatial relationship between archaeological sites and certain geomorphic landforms as an aide to the assessment of site integrity.

Programmatic Activities**Task A. Implementation of Historic Properties / Cultural Resources Site Monitoring Plan**

- **Landmark and Register Sites.** Potential National Historic Landmark District and National Register sites are of such importance and significance that they require periodic monitoring. Some sites may require annual monitoring because of their fragile or sensitive nature, while others can be monitored once every 2 or 3 years.
- **At-Risk Sites.** Some significant archaeological sites are at risk because of erosion and known or potential vandalism. These sites need to be monitored annually until conditions improve.

Task B. Strategic Planning Coordination at LANL

Because the DOE/NNSA missions are periodically modified and because of the continually aging infrastructure, strategic planning is an important aspect of normal operations. There is a continuing need for cultural resources staff to actively work with LANS facility/infrastructure planners (i.e. Operation and Infrastructure, Infrastructure and Site Planning, Utilities and Institutional Facilities, Project Management and Facilities Operations Directors, etc.) at all levels of planning to ensure that heritage resources are appropriately taken into account.

Task C. GPS Site Updates / Database Management

A number of previously recorded archaeological sites at LANL have yet to be subjected to the spatial coordinate precision achieved by the use of Global Positioning System (GPS) technology. Accurate site boundaries and site locations are important elements in determining land-use flexibility and in making effective evaluations in the LANL new project review process. This task permits the timely updating of site location information for these sites. In addition to adding more precise boundaries to the GIS database of LANL sites, the associated tabular information for all site database tables will be corrected to reflect changes in status and other physical attributes that have resulted from field checks, formal consultations with the SHPO, and cultural-resources-program survey and excavation projects.

Task D. Native American Consultation and Outreach (Traditional Cultural Properties and Native American Graves Protection and Repatriation Act)

Native American consultation and outreach is a continuous process given the density of archaeological resources with Ancestral Pueblo origin. In addition, erosion and other ground-disturbing mechanisms will continue to periodically inadvertently expose Native American burials and burial associations.

Task E. Cultural Heritage Public Education

The task is meant to cover both outreach and in-reach aspects of public education, including developing interpretive materials, signs, and web information and organizing/presenting lectures, tours, and other similar activities. In 2014, the Environmental Research and Monitoring Exhibit opened at the Bradbury Science Museum, and a large portion of this exhibit focuses on the archaeological work conducted at LANL. The museum has more than 80,000 visitors a year, and this exhibit has greatly expanded LANL's outreach / public education opportunities.

Task F. CRMP Update

In accordance with standard practice for federal agencies with cultural resources management plans, these plans are reviewed and updated every 5 years. Regarding the CRMP, this review cycle provides the time necessary to (1) carefully evaluate the successes and the issues that have come about from the CRMP's implementation during the previous 5 years, (2) make any necessary changes to the text and body of the CRMP, and (3) design a new Road Map.

Appendix B

Archaeological Site Significance and Eligibility Standards

Cultural Resources Report No. 321

Executive Summary

Los Alamos National Security, LLC (LANS) is responsible for supporting the Department of Energy (DOE), National Nuclear Security Administration (NNSA) Los Alamos Field Site Office (Field Office) in implementing and complying with the National Historic Preservation Act (NHPA). Field Office and LANS developed a Cultural Resource Management Plan (CRMP), which outlines the manner in which LANS and DOE/NNSA implement NHPA at Los Alamos National Laboratory (LANL). The CRMP is a comprehensive plan for cultural resource management and includes eligibility determinations for archaeological sites across LANL. Eligibility assessments consist of identification and documentation of the resource and an assessment of significance. During an assessment, cultural resource managers gather information about the known or potential archaeological resources. This information also allows for an assessment of significance. The process for determining archaeological site significance and eligibility described in this document will help cultural resources managers at LANL to develop strategies to manage resources in an effective and consistent manner. Creative mitigations and LANL-specific eligibility assessments are also discussed.

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Introduction

The U.S. Department of Energy (DOE) is responsible for implementing and complying with the National Historic Preservation Act (NHPA). The DOE / National Nuclear Security Administration (NNSA) Field Office and Los Alamos National Security, LLC (LANS) developed the Cultural Resources Management Plan (CRMP), which outlines the manner in which LANS and DOE/NNSA implement NHPA at LANL. The CRMP is a comprehensive plan that defines the responsibilities, requirements, and methods for cultural resource management. Approximately 10,000 years of human occupation are represented on the Pajarito Plateau ranging from the initial use of the area by Clovis hunter-gatherers to, most recently, the nuclear research conducted during the Manhattan Project and Cold War era. Archaeological resource sites range from the ephemeral campsites of ancient hunter-gatherers to the remains of large multi-story roomblocks of the Ancestral Pueblo people.

This document supplements the CRMP and provides the basis to evaluate the significance of the archaeological sites at LANL. It follows the model of the National Park Service (NPS), detailed in “The Secretary of the Interior’s Standards and Guidelines” (NPS 1983) and employs, National Register Bulletin 15 “How to Apply the National Register Criteria for Evaluation” (NPS 2002), and National Register Bulletin 36 “Guidelines for Evaluating and Registering Archaeological Properties” (NPS 2000).

Archaeological resources are organized into a series of types that encompass the full range of sites present at LANL. There are four specific criteria used to evaluate archaeological site significance for inclusion to the National Register of Historic Places (Register) which are detailed in the National Register Federal Program Regulations (36 CFR 60). Under the regulation, archaeological site significance rests in the site’s ability to possess integrity and one or more of the following four criteria:

- A) Sites that are associated with events that have made a significant contribution to the broad patterns of our history; or
- B) Sites that are associated with the lives of persons significant in our past; or
- C) Sites that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- D) Sites that have yielded, or may likely yield, information important in prehistory or history.

Archaeological sites are generally determined eligible under Criterion D, however, Criteria A, B, and C are appropriate in limited situations. Under Criterion A, a property must have well-preserved features, organization, and artifacts that illustrate the event or pattern of events. Under Criterion B, a site must be illustrative of the person’s life. Criterion C applies to sites that illustrate important concepts in pre-contact community design or are important representatives of the aesthetic values of the area cultures (e.g., rock art sites are generally eligible under C).

Under Criterion D a property is eligible if it has been used as a source of data and contains more as yet retrieved data or, if through testing or research, is determined to be a likely source of data. Under this latter requirement, the information must be evaluated within an appropriate context to determine its importance. Information is considered important when it is shown to have a significant bearing on a research design derived from historic contexts that contain three primary elements (1) a theme or research topic, (2) a period to which the research topic relates, and (3) a geographic area for which the research theme is applicable. In this case, the latter includes the landscape encompassed by LANL. The idea behind historic contexts is that archaeological sites are significant for a reason; thus, important or significant sites will be those that contribute to our knowledge of a research topic.

As part of the Land Conveyance and Transfer (LC&T) Project, LANS developed an archaeological significance standards plan, which provided a basis for evaluating the importance of archaeological sites (Vierra and Schmidt 2006). The plan included sections on research contexts and research themes. The context section detailed the natural environment and the local culture history. The research themes included chronometrics, geomorphic processes, paleoenvironment, settlement history and land use, subsistence and seasonality, technology, production and exchange, and archaeological site condition assessments (Vierra and Schmidt 2006). This document provided a framework for assessing site types and specific cultural periods during the LC&T Project. This current document updates the information based on what cultural resource managers learned from the LC&T excavations.

Previous Research on the Pajarito Plateau

Archaeologists have conducted research on the Pajarito Plateau since the early 1900s, beginning with the work of Edgar Lee Hewett. Overviews of the regional culture history are presented by Cordell and McBrinn (2012), Irwin-Williams (1973), Stuart and Gauthier (1981), Kohler (2004), and Powers (2005). The chronology for the northern Rio Grande (Table B.1) was developed by Wendorf (1954) and modified by Wendorf and Reed (1955). Detailed information about the cultural resources and culture history of the Pajarito Plateau is available in Vierra and Schmidt (2008) and McGehee et al. (2010).

Table B.1. Culture Historical Chronology for the Pajarito Plateau

Culture	Period	Dates
Paleoindian	Clovis	9500 to 9000 BC
	Folsom	9000 to 8000 BC
	Late Paleoindian	8000 to 5500 BC
Archaic	Jay	5500 to 4800 BC
	Bajada	4800 to 3200 BC
	San Jose	3200 to 1800 BC
	Armijo	1800 to 800 BC
	En Medio	800 BC to AD 400
	Trujillo	AD 400 to 600

Culture	Period	Dates
Ancestral Pueblo	Early Developmental	AD 600 to 900
	Late Developmental	AD 900 to 1150
	Coalition	AD 1150 to 1325
	Classic	AD 1325 to 1600
Native American, Hispanic, and Euro-American	Early Historic Pajarito Plateau	AD 1600 to 1890
	Homestead	AD 1890 to 1942
Federal Scientific Laboratory	Manhattan Project	AD 1942 to 1946
	Cold War (Early Cold War)	AD 1946 to 1990 (AD 1946 to 1956)

Archaeological Site Eligibility

Archaeological sites are evaluated for Register eligibility by employing the criteria for listing in the Register as well as using LANL-specific contexts and research themes. As noted above, archaeological sites are generally determined eligible under Criterion D. Under Criterion D, they must meet two requirements: the property must have, or have had, information to contribute to our understanding of human history or prehistory, and the information must be considered important. Criterion D most commonly applies to properties that contain or are likely to contain information bearing on an important archaeological research question.

There are three potential outcomes of an eligibility assessment: eligible, undetermined, or not eligible. A property is eligible if it has been used as a source of data and contains more, as yet unrecovered data, or is eligible if it has not yet yielded information but, through testing or research, is determined a likely source of data. Sites that require additional investigation to determine eligibility are assessed to have undetermined eligibility. All sites that have an undetermined eligibility assessment are treated and evaluated as a Register-eligible property until additional investigative measures are completed and the site is reevaluated. Sites lacking significance and integrity are not eligible.

Archaeological sites at LANL are evaluated for Register eligibility as part of site the documentation process. The first step in the evaluation process is to determine the site type, relative or absolute date, and context. The context evaluation involves documenting site location, setting, and extent and nature of the cultural materials. The second step is to determine whether the site has the integrity to address applicable research issues. This step involves establishing the presence of intact architecture, features, and undisturbed subsurface deposits. Factors assessed include topographic location, deposition/erosion, depth of soil deposits, evidence of bioturbation, and evidence of impacts from previous excavations, land development, or vandalism.

Archaeological Site Types

The physical location of a site may also provide information regarding past human activity. Prehistoric archaeological sites at LANL are those that date to the time before the establishment of a European presence in the upper Rio Grande Valley by the end of the 16th century. Historic sites at LANL include any archaeological resources dating after AD 1600 through the

Homestead period and the Manhattan Project and the Cold War. Isolated occurrences are single isolated features, an artifact, or artifact assemblage that contains less than 10 artifacts per 100 square meters, and are excluded as archaeological sites. These cultural remains, which represent a single activity, include isolated projectile points, groundstone artifacts, and pot drops.

As of January 2015, approximately 90 percent of LANL property has been subject to intensive survey in compliance with federal standards for complete survey coverage. There are approximately 1800 archaeological sites situated on LANL property (Tables B.2 and B.3).

Table B.2. Prehistoric Sites at Los Alamos National Laboratory *

Site Type	Temporal Affiliation									
	Undetermined	Und. Prehistoric	Archaic	Ancestral Pueblo	Developmental	Late Developmental/ Early Coalition	Coalition	Late Coalition/ Early Classic	Classic	Total
Lithic Scatter	24	58	91	0	0		0	0	0	173
Lithic and Ceramic Scatter	6	17	9	21	1		51	16	22	143
Pit structure	0	0	0	0	0		2	0	0	2
1 to 3 Room Structure	10	7	0	120	1		151	53	78	420
Talus House	1			1			1			3
Pueblo Roomblock	0	0	0	22	6	1	279	38	6	352
Complex Pueblo	0	0	0	2	0		33	9	2	46
Cavate	16	6	0	89	0		90	28	35	264
Rock Shelter	21	5	1	11	0		18	5	7	68
Kiva	0	0	0	0	0		1	0	0	1
Grid Garden	0	2	0	8	0		6	1	5	22
Water Control Feature	4	1	0	6	0		9	2	2	24
Thermal Feature	2	2								4
Bedrock or Boulder Feature	1	2	0	2	0		0	0	0	5
Rock Feature	35	8	0	6	0		6	0	8	63
Rock Ring	7	0	0	0	0		2	0	0	9
Rock/Wood Enclosure	3	0	0	0	0		1	0	0	4
Rock Art	9	3	0	62	0		6	2	2	84
Game Pit	1	1	0	10	0		0	1	0	13
Trail and/or Stairs	7	7	0	26	0		6	1	1	48
Total	147	119	101	386	8	1	662	156	168	1748

*Note: Table records the primary component for each site.

Table B.3. Historic Sites at Los Alamos National Laboratory*

Site Type	Temporal Affiliation					
	Undetermined Historic	Early Historic	Homestead	Manhattan/Cold War	Recent	Total
Lithic and Ceramic Scatter	1	1	0			2
Cavate	1	0	0			1
Rock Shelter	1	0	0			1
Water Control Feature	1	0	4			5
Bedrock or Boulder Feature				1		1
Rock Feature	4	0	4	1		9
Rock Ring	2	1	0			3
Rock/Wood Enclosure	11	0	2	1		14
Inscriptions and Dendroglyphs	2	0	1	1		4
Trail/Stairs	2	0	4	3	1	10
Historic Infrastructure	2	0	4			6
Historic Structure	5	0	16	10		31
Historic Artifact Scatter	2	0	27	7		36
Road	4	0	13	2		19
Historic Other	1	0	2	0		3
Total	39	2	77	26	1	145

*Note: Table records only the primary component for each site.

Descriptions of archaeological site types used at LANL are included below. Following the description is an indication of the number of known sites of that type and the number currently assessed for eligibility to the Register. There is also a brief discussion of site type significance. The significance discussion relies heavily on Brown's (2011a) National Register of Historic Places Multiple Property Documentation Forms prepared in support of the Bandelier National Monument Archaeological and Historical District. As noted by Brown (2011b), the foundation for the Ancestral Pueblo and Archaic period resource sections were Santa Fe National Forest Multiple Property submission forms developed for the Pajarito Plateau (Elliott 1990) and for Jemez Mountain Archaic period sites (Peterson et al. 1993). It should be noted that the site type count reflects the number of sites for which the type is the primary site. There are instances where other site types are included as features associated with the primary site type.

Prehistoric Architectural Sites

Pueblo roomblocks, complex pueblos, pit structures, cavates, and one- to three-room structures are all sites that functioned, or a portion of the sites likely functioned, as habitation sites. For architectural sites such as pueblo roomblocks, complex pueblos, pit structures, cavates, and one- to three-room structures to have the data potential to answer research questions, the site must meet one or more of the following (Elliott 1990):

- A site must contain undisturbed deposits sufficient to demonstrate meaningful spatial relationships among artifacts, features, floral remains, and faunal remains.
- A site must contain structures, features, or artifacts that will permit inferences regarding human activities and site function.
- A site must contain structures, features, or artifacts that will permit inferences regarding settlement characteristics.
- A site must contain macrobotanical, microbotanical, or faunal remains indicative of subsistence practices.
- A site must contain datable ceramics, wood, charcoal, baked clay, or obsidian that will permit chronological placement.
- A site must contain intact architectural features that permit analysis of floor space, floor features, and other spatial organizational characteristics.

Pueblo Roomblocks

Pueblo roomblocks are contiguous, multiroom habitation structures (four or more rooms with no enclosed plaza) with walls constructed of adobe, jacal, or masonry. Roofs are usually flat and constructed by laying logs, used as roof beams, across the walls and laying small sticks or branches perpendicular to the logs, and these are overlaid with adobe or adobe plaster.

Approximately 350 Ancestral Pueblo roomblock sites have been located at LANL; 120 have been assessed for eligibility to the Register. Of these, 118 have been determined eligible, one is of undetermined eligibility, and one is not eligible to the Register. A majority of the pueblo roomblock sites (279) are affiliated with the Ancestral Pueblo Coalition period.

In general, pueblo sites at LANL have escaped pothunting and as the lower portion of rooms are generally encased by collapsed roofs and wall fall, the remains are well preserved. Subsurface contexts should accurately reflect natural site formation processes. Since pueblo roomblocks were occupied year-round and were places where people lived, worked, slept, worshiped, procreated, and died; they should contain a full range of material culture remains (Elliott 1990). Archaeological information from these sites can be used to address a wide range of research questions related to chronology, settlement patterns, subsistence, demography, social and political organization, architecture, economics, immigration, technology, trade, religion, land tenure, and ethnic identity. Three pueblo roomblocks were excavated during the LC&T project (Vierra and Schmidt 2008).

Plaza or Complex Pueblos

Plaza or complex pueblos contain one pueblo roomblock that partially (three sides) or completely enclose a plaza and/or contain two or more roomblocks located close together (less than 200 meters apart). Plaza or complex pueblos typically are much larger (in both room numbers and site size) than pueblo roomblock sites, often representing structures originally two or three stories in height. There are 46 complex pueblo roomblocks at LANL; 18 have been assessed. Of these 17 have been determined eligible and one has undetermined eligibility. Like the pueblo roomblocks, a majority of the plaza or complex pueblo sites (33) are affiliated with the Ancestral Pueblo Coalition period. The plaza or complex pueblo site definition was redefined at LANL and excludes smaller “L” shaped pueblos. As a result, 20 sites previously included in this category have been reclassified as pueblo roomblocks. Unfortunately, site information from some of the older documented sites is too vague to allow a reclassification review. As field visits are conducted, the number of plaza or complex pueblos will likely decrease.

Plaza or complex pueblos associated with the Ancestral Pueblo Late Coalition and Classic periods are the largest prehistoric sites on the Pajarito Plateau. Subsurface contexts should accurately reflect natural site formation processes. Since these sites were occupied year-round and the full range of activities related to pueblo life was performed, material culture remains should provide important information concerning chronology, settlement patterns, subsistence, demography, social and political organization, architecture, economics, immigration, technology, trade, religion, land tenure, and ethnic identity (Elliott 1990). No plaza or complex pueblo sites were excavated as part of the LC&T Project.

Pit Structures

Pit structures are presumed habitation sites with evidence of one or more structures built entirely or partially underground. The two pit structures identified at LANL are affiliated with the Coalition period and are eligible to the Register. Because pit structures are often filled by natural erosional processes, there is good potential that remains will be well preserved. Since many of the activities related to pueblo life were generally performed in the contexts of structural sites, archaeological information could be used to address a very wide range of research questions related to chronology, settlement patterns, subsistence, demography, social and political organization, architecture, economics, immigration, technology, trade, religion, land tenure, and ethnic identity (Elliott 1990). No pit structures were excavated as part of the LC&T Project.

Cavates

Cavates are rooms carved into a cliff face within the Bandelier Tuff geological formation. The category includes isolated cavates, multiroomed contiguous cavates, and groups of adjacent cavates that together form a cluster or complex. Some cavates include attached masonry rooms (talus houses) built in front of a cavate. Cavates appear to have been used for habitation, storage, places to stay during hunting or agricultural endeavors, lookouts, religious practices, and other purposes. There are 265 cavate sites at LANL; 99 have been evaluated for Register eligibility. Of these, 71 are eligible, 21 are undetermined, and seven are not eligible. In general, extremely eroded cavates are not eligible. The majority of the cavate sites are associated with the Ancestral Pueblo occupation. Of the remaining unevaluated cavate sites, six have an undetermined

prehistoric affiliation, 16 have an undetermined affiliation, and one site has an undetermined historic era affiliation.

The significance of cavates lies in their uniqueness; they are unique architecturally and the information they contain is often well preserved. The same classes of information are usually not well preserved in open sites. These classes of data include macrobotanical, microbotanical, and faunal specimens; human remains; and basketry, sandals, blankets, textiles, and artifacts made of wood. Perishable datable resources such as tree-ring samples and carboniferous materials are also usually well-preserved (Elliott 1990). Many activities related to pueblo life were performed at structural sites such as cavates. Archaeological information from these sites can be used to address a wide range of research questions related to chronology, settlement patterns, subsistence, demography, social and political organization, architecture, economics, immigration, technology, trade, religion, land tenure, and ethnic identity (Elliott 1990). In addition to their research information potential, cavates are also potentially eligible under Criterion C as embodying the distinctive characteristics of a type, period, or method of construction. No cavates were excavated as part of the LC&T Project.

One- to Three-Room Structures/Fieldhouses/Talus Houses

One- to three-room structures (also known as fieldhouses) are small surface structures constructed of adobe, jacal, or masonry. A fieldhouse typically consists of square to rectangular-shaped rock alignments, with individual units no more than three meters in length. One- to three-room structures are often associated with agricultural features but may also have been used for other temporary habitation purposes such as storage, places to stay during hunting or plant gathering, and lookouts. A talus house is a one- to –three-room structure located adjacent to a canyon cliff face. Typically, talus houses are constructed in front of cavates and are included as an associated feature under the cavate site type.

Approximately 400 one- to three-room structures and three talus houses have been located at LANL; 141 have been evaluated for eligibility to the Register. Of these, 96 are eligible, 31 are undetermined, and 14 are not eligible to the Register. The vast majority of one- to three-room structures are associated with the Ancestral Pueblo occupation of the Pajarito Plateau. Seven of the remaining unevaluated sites have an undetermined prehistoric affiliation, and 10 are assessed to have an undetermined affiliation.

These small structural sites likely served a variety of possible functions, including temporary habitation, storage, hunting lodges, lookouts, and probably other functions that are not immediately obvious. It seems most likely that the one- to three-room structures played an important role in subsistence by serving as short-term residences for a single individual or family during the planting and harvesting seasons. As the most common site type at LANL, one- to three-room structures were obviously an important element in the settlement system. Previously excavated one- to three-room structures have contained intact features such as hearths, storage pits, and floors. Such sites have yielded dateable chronometric samples and preserved macrobotanical and microbotanical remains.

One-to three-room structures were occupied for short periods and were associated with more specific tasks and activities than other living sites. Although there are fewer artifacts at these sites, they do provide information to address research questions related to settlement patterns,

subsistence, architecture, technology, economics, land use and tenure, labor investment, and chronology. Twenty-six one- to three-room structures were excavated during the LC&T Project (Vierra and Schmidt 2008).

Rock Shelters

Rock shelters are overhangs, indentations, or alcoves formed naturally in a rock face or large boulder, or alternatively, a partially enclosed area created by rock falls leaning against a rock face or large boulder and which exhibit evidence of human use. Low, dry-laid rock walls are the most common form of architectural elaboration. Rock shelters were used during prehistoric times and subject to early historic use or reuse. Sixty-nine rock shelter sites have been recorded at LANL; 37 have been evaluated for Register eligibility. Of these, 19 are eligible, 12 are undetermined, and six are not eligible to the Register. Most of these sites are affiliated with the Ancestral Pueblo period (41 sites) or have an undetermined cultural affiliation (21 sites). Like one- to three-room structures, rock shelters were occupied for short periods and were associated with specific tasks and activities. They have potential to address a range of research questions related to settlement patterns, subsistence, technology, economics, land tenure, and chronology. No rock shelters were excavated as part of the LC&T Project.

Kivas

Kivas are Ancestral Pueblo ceremonial rooms, though they were used for weaving, housing and other kinds of activities as well. They are typically circular and subterranean; in some cases they were excavated into bedrock. Most kivas are associated with habitation sites, but some are found in isolation. Kivas are most likely associated with religious or ceremonial use of a particular locale. Archaeological information from these sites could be used to address research questions related to religion, ceremony, and worldviews, as well as political organization, ethnic identity, and cultural landscapes. One kiva, associated with a pueblo roomblock, was excavated as part of the LC&T Project (Vierra and Schmidt 2008).

Rock Rings / Rock Features

Rock rings are circular arrangements of rocks. Some of these represent the residue from a dismantled tipi or wickiup. Another category of rock rings includes circular arrangement of shaped or unshaped tuff blocks, sometimes with shaped stone uprights that may represent Ancestral Pueblo shrines. Rock features are typically isolated examples of rock piles, amorphous rock concentrations, and/or upright stones. The latter sometimes are in the shape of a ring several meters in diameter and are often referred to as “rock rings.” Some of these rock features may be identical to what researchers refer to as shrines and boundary markers.

The current database of LANL sites has 12 rock rings and 72 rock features. As the site type definitions have significant overlap, the two categories have been combined into one type for the purpose of this discussion. Twenty-seven of the sites have been evaluated for Register eligibility, with 12 assessed to be eligible, nine undetermined, and six that are not eligible. Many of the rock ring / rock feature sites do not have a well-defined cultural affiliation with approximately half of the sites listed as undetermined (42 sites) and eight sites having an undetermined prehistoric affiliation. Of the remaining sites, most are affiliated with the Ancestral Pueblo period (22 sites). One rock ring site appears to be the remains of an Athabaskan tipi ring. Two Apache tipi ring

sites located in the Rendija Canyon area were excavated as part of the LC&T Project (Vierra and Schmidt 2008).

Obscured within the rock ring and rock feature site types are sites that are assessed to be possible shrines. A shrine is a functional designation, whereas rock ring and rock feature are descriptive types with an unknown function. As there appears to be no objective basis for identifying a shrine from a rock ring and rock feature, the potential shrines have not been broken out of the latter site categories. The assumption that a rock ring and rock feature is a shrine appears to be dependent on the recorders' experience and their knowledge of the project area.

Rock ring and rock feature sites can contain information concerning settlement patterns, subsistence, technology, economics, land tenure, and chronology. Shrines can also contain information on ceremonial and religious practices, as well as specific reference to the landscape and particularly landmarks with cultural significance. Shrines continue to be of importance to members of affiliated tribes and have the additional element of being potentially eligible as Traditional Cultural Properties (TCPs) in addition to their status as archaeological sites. There is one site listed as a shrine and five others listed as possible shrines within the rock ring site type. Eight of the rock feature sites are listed as TCPs and another 10 are listed as possible shrines.

Grid Gardens / Water-Control Features

Grid gardens are small, formal agricultural areas, often bounded with cobbles and containing gravel mulch (e.g., grid gardens and/or terraces). This site category typically consists of square to rectangular-shaped rock alignments, with individual units being more than 3 meters in length (in contrast to one- to three-room structures that are no more than 3 meters in length). Water-control features are devices that control the flow of water, particularly runoff, and also trap silt from runoff, creating a small flat fertile area that can be utilized for planting.

The current database of LANL sites has 29 water-control features and 22 grid gardens. As the site types are similar in function, the two categories have been combined into one type for this document. Nineteen of the sites have been evaluated for Register eligibility, with 10 eligible, seven potentially eligible, and two that are not eligible. Most of the water-control features and all but two of the garden plot sites have an Ancestral Pueblo cultural affiliation.

Grid gardens and water-control sites can provide microbotanical and macrobotanical information regarding the types of crops grown at a particular location and answer questions related to the adoption of agriculture, prehistoric farming techniques, diet, and land tenure, among others. Three grid gardens were excavated as part of the LC&T Project (Vierra and Schmidt 2008).

Game Pits

Game pits are cavities dug down into the tuff bedrock presumed to have been used as a passive hunting drop site for larger game animals (e.g., deer) or as concealment to lure and trap birds. Some game pits are excavated into the bedrock of promontories, while others were dug in the courses of prehistoric trails; the latter are assumed to post-date migration of Pueblo peoples off the Pajarito Plateau to their present pueblo locations (Steen 1977). Thirteen game pits are located at LANL, of which only three have been evaluated for Register eligibility. One of these sites is

eligible and two are undetermined. Twelve of the game pits are assessed to be prehistoric with 10 of them affiliated with the Ancestral Pueblo period.

Game pits contribute to our understanding of hunting techniques generally but also to the procurement of specific types of game, some of which may have religious and ceremonial significance. Traps that appear to post-date Ancestral Pueblo occupation also shed light on use of the Pajarito Plateau after people moved off and closer to the Rio Grande. No game pits were excavated as part of the LC&T Project.

Rock Art

Rock art includes several subtypes including petroglyphs, pictographs, and rock art panels. A petroglyph consists of a design or set of symbols scratched, pecked, or scraped into a rock or plastered surface, and which is distinguished from historic and modern graffiti. A pictograph consists of a design or set of symbols painted rather than pecked, scratched, or scraped. A rock art panel consists of a series of petroglyphs (and, rarely, pictographs inside rock shelters and cavates) grouped together on a cliff face or boulder. Of the 84 rock art sites documented at LANL, 31 have been evaluated for Register eligibility. Twenty-two of the assessed rock art sites are eligible to the Register, while nine sites have an undetermined status. Seventy-two of the rock art sites are affiliated with the Ancestral Pueblo period, with nine sites having undetermined affiliation and three sites having undetermined prehistoric affiliation.

Because of their depictive nature, rock art sites are often thought of as representing world views, culture, and religious thought. Through style and content, one can also analyze them from a perspective of ethnic identity, cultural territory, and broader religious affiliations. Rock art sites were analyzed as part of the LC&T Project (Vierra and Schmidt 2008).

Trail/Stairway

A trail is a prehistoric or historic path defined by use-wear or cutting into bedrock or soil surfaces, along with any revetments, embankments, or other structural components of the trail. A stairway is a set of two or more steps carved into a steep section of tuff bedrock, typically associated with trails or access to cavates. Fifty-eight trail/stairway sites have been identified at LANL; 24 of them have been assessed for Register eligibility. Of these, six are eligible, 13 are undetermined, and five are not eligible to the Register. Forty-one of the trail/stairway sites are assessed to be prehistoric, with 34 being affiliated with the Ancestral Pueblo period.

Trails and stairways can provide information concerning resource procurement, travel, settlement patterns, social networks, trade, engineering and construction techniques, and the relationship of all those elements to the landscape. As rock art is often associated with trails and related features, trails can be associated with research into cultural identity and territories. No trail and/or stairway sites were analyzed as part of the LC&T Project.

Artifact Scatters

Lithic Scatter

A lithic scatter is a cluster of chipped stone tools and/or pieces of chipped stone produced during the manufacturing of chipped stone tools. One hundred seventy-three lithic scatters have been

located at LANL; 78 sites have been assessed for eligibility. Of these, 33 are eligible, 32 are potentially eligible, and 13 are not eligible to the Register. About 90 lithic scatters are associated with the Archaic period, with the remaining sites having an undetermined prehistoric (58 sites) or undetermined (24 sites) cultural affiliation.

Chipped stone artifacts have the potential to provide information on technology, chronology, raw material procurement, and trade. Snead (2008) has suggested that some artifact scatters on the Pajarito Plateau are indicative of field locations in the same way one- to three-room structures or fieldhouses are and can be analyzed to answer questions about seasonality, subsistence and diet, land and resource use, and labor investment. Four lithic scatters were excavated during the LC&T Project (Vierra and Schmidt 2008).

Lithic and Ceramic Scatter

Lithic and ceramic scatters contain a combination of ceramic sherds, chipped stone, and/or ground stone artifacts, but lack identifiable surface structural remains or evidence of pit structures. One hundred and forty-five lithic and ceramic scatters have been documented at LANL; 79 have been evaluated for Register eligibility. Of these, 25 are eligible, 20 are undetermined, and 34 are not eligible to the Register. Most of these artifact scatters have an Ancestral Pueblo cultural affiliation (111), and nine of the sites are multi-component, with one of the components being Ancestral Pueblo.

Artifact scatters have the potential to provide information on technology, chronology, raw material procurement, and trade. As with lithic scatters, some artifact scatters are indicative of field locations in the same way field houses are and can be analyzed to answer questions about seasonality, subsistence and diet, land and resource use, and labor investment (Snead 2008). Three lithic and ceramic scatters were excavated as part of the LC&T Project (Vierra and Schmidt 2008).

Bedrock/Boulder Features

Bedrock/boulder features are sites where cultural features have been excavated into bedrock or boulders that are not cavates or game pits. Examples include grinding slicks, mortars, water channeling grooves, and isolated holes excavated into horizontal rock surfaces. Grinding slicks, the most common bedrock modification on the Pajarito Plateau, are concave depressions in bedrock/boulders created by the sharpening of stone axes, the pulverizing and grinding of plants, or other related activities. There are six bedrock and boulder feature sites documented at LANL. The one Register-assessed site has an undetermined eligibility. Five of the sites have a prehistoric affiliation, and one appears to be related to the Cold War era.

Grinding features are indicative of the processing of food or other materials; they convey information on food procurement, processing technology, and diet, and may provide information on resource locations if their location cannot be explained by affiliated habitation sites. Some bedrock features may be associated with Native American resource collection and process locations and may be Register eligible as a TCP. No bedrock/boulder feature sites were analyzed as part of the LC&T Project.

Thermal Features

Thermal features are sites that contain a concentration of ash and/or charcoal (with or without burned rock) that indicate a hearth; alternatively, these features may be rock concentrations that are thermally discolored and/or broken into debris (fire-cracked) that indicate a roasting pit or hearth. Four thermal features are documented at LANL, two of which have been assessed for Register eligibility. One is eligible, and one has an undetermined Register eligibility.

Hearths and roasting pits located outside of habitation sites are most often indicative of a temporary campsite. These sites are indicative of short-term use for resource procurement and processing or seasonal agricultural work. They provide information concerning subsistence, resource procurement and processing, economics, land tenure, and chronology. No thermal features were excavated as part of the LC&T Project.

Historic Structures

Archaeologically, historic structures are buildings or other structures constructed after AD 1890. This site type does not include rock/wood enclosures, roads, or other infrastructure features. Thirty-one historic structures have been documented at LANL; 21 have been assessed for Register eligibility. Fifteen structures are eligible, one is undetermined, and five are not eligible to the Register. Of the 31 historic structures, 16 are affiliated with the Homestead era.

Historic structures provide information that could be used to address a wide range of research questions related to settlement patterns, subsistence, social and political organization, technology, economics, land tenure, and ethnic identity. One historic homestead structure was excavated as part of the LC&T Project (Vierra and Schmidt 2008).

Rock/Wood Enclosures

Rock and wood enclosures are small areas enclosed by loosely stacked rock or log alignments (e.g. corral or lambing pen). These are distinguished from one- to three-room structures by the nature of the stacking methods and often by the presence of historic artifacts in and around the enclosure. Eighteen rock or wood enclosures have been documented at LANL; nine have been evaluated for the Register. Four of the evaluated sites are eligible, four are undetermined, and one is not eligible to the Register. Fourteen of the enclosures have a historic period affiliation.

Through the early historic period the Pajarito Plateau was used for sheepherding and ranching, which increased exponentially at the end of the 19th century once the Navajos and Apaches were confined to reservations and the railroad came into the area. Sites related to small-scale herding have the potential to provide information on seasonal use of the Plateau, including subsistence and diet, land and resource use, and ethnic identity. Sites associated with the large-scale livestock industry are indicative of a significant change in the economy of the region and an intensity of land use with long-term environmental consequences. No rock/wood enclosures were excavated as part of the LC&T Project.

Roads

Roads are formal routes used for the passage of vehicles, along with revetments, embankments, or other structural components of the road. Roads that exhibit rutted tracts in bedrock as a result of historic wagon use form the majority of sites included in this category. Nineteen roads have been documented at LANL; 12 have been evaluated for Register eligibility. Two of the road segments are eligible, four are undetermined, and six are not eligible. All of the wagon road segments are affiliated with the Pajarito Plateau Homestead era.

Livestock and logging roads were temporary and informal, mostly containing information on where the most intensive operations of these industries were located. The more formal roads were associated with longer-term use by homesteaders and by Manhattan Project and Cold war researchers and security personnel. Roads can provide information concerning settlement patterns, community organization, technology, economics, and communication. No roads were analyzed as part of the LC&T Project.

Historic Infrastructure

Historic infrastructure sites are the basic physical and organizational structures and installations needed to support a community such as transportation systems, water supply, sewers, electrical grids, telecommunications, etc. Some examples from LANL include historic water catchment devices, fence lines, and telephone lines. Water catchment devices are small structures for the collection of water. This category includes cisterns, reservoirs, stock ponds, and retention dams. Roads, trails, corrals (rock/wood enclosure), and water-control features are not included, as they are listed as separate site types. This archaeological site category should not be confused with the LANL Support Building and Structures site type, which is a historic building category.

There are currently six historic infrastructure sites documented at LANL, which include a telephone line, fence segments, and water catchment devices. One fence line and two catchment devices have been formally assessed and are not eligible to the Register. Four of the sites have a homestead era affiliation, and two have an undetermined historic affiliation. Infrastructure sites can provide information concerning settlement patterns, resource utilization, community organization, technology, economics, and communication. No historic infrastructure sites were excavated as part of the LC&T Project.

Historic Artifact Scatter / Trash Scatter

A historic artifact scatter is a concentration of items, including Euro-American artifacts, produced and deposited after AD 1600 (but most typically deposited after AD 1890). Thirty-six historic artifact scatters have been located at LANL; 13 have been evaluated for Register eligibility. Four of the evaluated sites are eligible and nine are not eligible to the Register. Twenty-seven of the artifact scatters are affiliated with the Homestead era. Artifacts have the potential to provide information on technology, period, trade, subsistence and diet, land tenure, and ethnic identity. No historic artifact scatter / trash scatters were excavated as part of the LC&T Project.

Inscriptions and Dendroglyphs

Inscriptions and dendroglyphs are historic designs, letters, numbers, or symbols scratched, pecked, scraped, or carved in stone or tree bark. Many of the symbols provide information on the names, ethnicities, and gender of the people who made them; some also contain dates that provide a temporal affiliation. Currently there are three inscription sites and one dendroglyph site documented at LANL. One site has been formally assessed and has undetermined eligibility.

Sites that do not readily fit into one of site type categories above are listed as *prehistoric or historic other* sites. Currently there are no prehistoric other sites and only three historic other sites. These sites include a 1913 Ramon Vigil Grant brass cap, a 1938 section marker, and a wood harvesting area. Since they have been documented, the land grant and section markers have no additional potential to answer research questions, and are not eligible. The wood harvesting area has not been documented or assessed for Register eligibility. In general, these sites have or had potential to address research questions concerning land and resource utilization, economics, and intensity of land use with long-term environmental consequences. No inscriptions or dendroglyphs were analyzed as part of the LC&T Project.

Site Integrity

As discussed in the previous section, the Pajarito Plateau is a culturally rich area with sites that have the potential to address numerous research issues. There are sites from each site type and culture that are eligible to the Register for their research potential. Conversely, there are specific sites that are not eligible or no longer eligible due to lack of integrity or research information potential. National Register Bulletin 15 (NPS 2002) and National Register Bulletin 36 provide guidance on evaluating archaeological site significance and denote four criteria that should be used:

- A. That are associated with events that have made a significant contribution to the broad patterns of our history; or
- B. That are associated with the lives of significant persons in our past; or
- C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- D. That have yielded or may be likely to yield, information important in history or prehistory.

In addition, the quality of significance in American history, architecture, archeology, engineering and culture must be present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association (NPS 2000 and 2002).

Archaeological site integrity is commonly defined by several factors, including the presence of undisturbed (*in situ*) surface and subsurface deposits, intact architecture, and features. When assessing a site for integrity, it must be determined which aspect of the site can provide

information that is relevant to answering specific research questions. Integrity is most easily assessed at archaeological sites that contain obvious surface evidence of architecture (e.g., roomblocks). Assessment becomes somewhat more difficult for those sites with minimal architecture or features (e.g., fieldhouses, agricultural features, or rock features). Finally, assessment can be difficult at surface artifact scatters that exhibit no obvious surface features and for which the nature of subsurface cultural deposits is difficult to discern.

Surface artifact scatters reflect the ephemeral remains of temporary campsites or limited activity locations and are often difficult to evaluate for potential significance. Three general contexts are commonly used to evaluate their data potential under Criterion D: chronology, technology, and geomorphology. Chronology refers to the presence of datable materials, which can be used to temporally place the site. Technology refers to the composition of the assemblage, including the number and variety of artifact types represented. Lastly, geomorphology refers to the geologic context of the site and whether the cultural material is in situ, has been redeposited, or affected by facility operations. Geomorphology and site integrity are closely linked.

Effects of the Natural Environment

The natural environment can have both a positive and negative effect on archaeological site integrity. Rapid deposition can often help to preserve cultural deposits, whereas the processes of erosion and deflation can have a detrimental effect. Deposition varies a great deal across the Pajarito Plateau with respect to mesa top, cliff/talus slope, and canyon bottom settings. The highest potential for site preservation exists on mesa tops in locations with little or no erosion, on alluvial fans, and in deep canyon bottom deposits. Conversely, settings with the lowest potential for site preservation occur along the margins of mesas due to runoff that has eroded soils and exposed bedrock (Reneau 2006). Widespread eolian and colluvial deposition during the latest Holocene has meant that Ancestral Pueblo sites are well preserved in a variety of settings. Conversely, with net erosion during the Holocene across most of the landscape, middle to late Holocene deposits are less extensively preserved with Archaic sites often found in secondary context (Drakos and Reneau 2008).

Perhaps the single greatest natural impact is ongoing erosion, ranging from sheet wash to actual gully formation. The effects of erosion range from displacement of artifacts and surface features to complete destruction of architectural remains and deeper archaeological deposits where gullies develop through sites. Even if a site is not directly affected by a gully, such drainages can cause undercutting of previously stable areas leading to collapse. Even cavates, as they are carved into soft and friable tuff, often exhibit erosion around the entrances and exhibit internal fissures resulting from water draining through the bedrock (Brown 2011a).

Fires can cause damage to archaeological sites both directly and indirectly (Nisengard et al. 2002). Directly, they can consume perishable materials, including wood, bone, food remains, and so forth. If temperatures are high enough, they can drive the moisture from obsidian artifacts (destroying obsidian hydration dating potential), oxidize or carbonize sherds (obscuring the designs), and cause chert to fracture (skewing the proportion of debris versus flakes for lithic reduction analysis). High heat in direct proximity to rock art panels can cause portions of the stone to spall, taking the images with them, and in the vicinity of open structures, high heat can

cause exposed tuff building blocks to crack and spall. Indirectly, increased erosion resulting from the loss of vegetation during severe fires can also affect archaeological deposits (Brown 2011a).

Traffic by large animals such as elk and deer can result in limited displacement of architectural elements and damage to archaeological deposits. Occupation of cavates by sheep and goats in historic times resulted in deposition of trampled “mats” of dung as well as damage to the archaeological deposits in and around the cavates. Animal burrowing can disturb archaeological remains by destroying stratigraphic layering and bringing artifacts to the surface that would otherwise remain buried (Brown 2011a). In addition, drought and potentially related bark beetle manifestations can kill trees that can uproot archaeological deposits when they fall.

Effects of Facility Operations

Facility operations pose a potential threat to archaeological site integrity. This might consist of vehicular traffic, construction activities, vibrations from explosives testing, or contamination. The LANL project review process allows cultural resource managers to evaluate all undertakings that could have an adverse effect on cultural resources. LANS Policies 400 and 401 require all new or modified projects to be reviewed by a cultural resources manager to determine if the activity will occur in the vicinity of an archaeological site and whether the proposed activity could impact the site. LANL has been a nuclear research facility for almost 70 years.

Contamination from operations is a potential factor affecting archaeological site integrity. The DOE/NNSA has provided some limited guidance on managing cultural resources that may be located in contaminated areas. However, this guidance specifically deals with potential radioactively contaminated Native American human remains or sacred objects. The guidance specifically states that DOE sites should develop a testing program to identify contamination and set specific limits that would not cause an individual to receive a radiation dose in excess of the basic public dose limits (DOE 1999), and that this program should follow DOE Order 458.1, *Radiation Protection of the Public and Environment*. LANS will not conduct data recovery on sites where the activities have the documented potential to expose workers to radiation levels that would exceed the established public dose limit. Adverse effects to these sites will be resolved through another form of mitigation. There is currently one archaeological site at LANL where soil testing has been conducted to establish potential radioactive contamination.

Site Eligibility and Integrity

Sites that have no significance or integrity or have lost their significance or integrity, thus information potential, are not eligible to the Register. Examples of LANL sites that have lost their integrity and are not eligible include sites that have been destroyed or collected and sites significantly impacted by erosion.

Archaeological sites determined eligible or potentially eligible under Criterion D only, and have been destroyed due to excavation, pothunting, historic construction activities, or through other mechanisms, are no longer eligible to the Register due to lack of research potential. However, if a site is eligible under A, B, or C excavation or other destruction/disturbance may not render the site ineligible.

Surface artifact scatters that have been completely collected are no longer capable of yielding important information and are not eligible to the Register. At LANL, several small lithic and ceramic and lithic scatters were 75 to 100 percent collected during the Pajarito Archaeological Research Project (1977 to 1985). These sites cannot be relocated to assess their research potential and are no longer eligible to the Register.

Sites that have experienced a significant degree of natural and/or cultural disturbances due to land alteration are no longer eligible to the Register. Natural disturbances includes sites severely damaged by erosion such as sheet washing or arroyo cutting. Redeposition and/or the mixing of soil deposits destroys the stratigraphic context of cultural remains. Examples include artifacts and features from a scatter site and/or structural remains from a one- to three-room structure, agricultural feature, or rock feature transported down a ridge slope into a secondary context. Bioturbation is another source of soil disturbance that can destroy the integrity of a site. A relevant example at LANL involves one- to three-room structures significantly damaged by the uprooting of trees that died due to drought and bark beetle damage. Another example involves archaeological sites (e.g., artifact scatters) that are deflated with the remaining artifacts lying on bedrock and lacking cultural context.

Erosion can also severely damage or destroy the integrity of sites that are carved or pecked into bedrock. Petroglyph sites are one example where the surface layer of a boulder or bedrock can spall, totally removing the image or enough of the image that it is no longer identifiable and lacks elements of design and cultural affiliation. Erosion can also destroy the integrity of cavates with fissures created from water flowing through the bedrock, which then breaches the cavate, destroys internal features and/or removes cultural fill. Eolian processes can also obliterate external features associated with cavates as well as scour out any cultural fill. The result is a cavate with no additional research potential.

At LANL, there is a potential for the presence of certain constituents to affect site integrity. Should a site have potential for contamination, a Radiological Control Technician will survey the site and surrounding area to determine the nature and extent of the contamination. If the cultural remains or encompassing soils have constituents that pose a risk to human health, then the site could be assessed as not eligible. This assessment will only be employed if it is demonstrated that implementation of a data recovery program, including recovery of cultural materials, would pose an immediate health and safety concern. A not eligible assessment will facilitate the implementation of protective measures such as capping the site or removing the contaminated materials to an approved waste storage facility to ensure future public and environmental health and safety.

Site Eligibility and Information Potential

When assessing for Register eligibility, it must be determined which aspect of the site can provide information that is relevant to answering specific research questions. For some sites the research potential does not go beyond the information that has been collected during the site documentation phase. Such information includes site type, location, affiliation, and the surface material culture. Once the site has been thoroughly recorded, the site retains no further research information potential. Examples include sites that contain surface artifacts (historic trash scatter) or features (cairn) with no potential for subsurface remains, or sites such as artifact scatters that

are located on bedrock or in areas where the soil deposits overlying bedrock are so shallow that there is no potential for intact subsurface deposits. Once these sites are thoroughly documented, they retain no additional research information potential and are not eligible to the Register. There is also an issue of diminishing return. Sites that have no integrity or have lost their integrity and sites whose data potential has been realized through data recovery are not eligible to the Register.

Block Site Type Eligibility Assessments

The data recovery program conducted for the LC&T Project provided invaluable information as to the topographic context as well as the nature and condition of many historic properties located at LANL (Vierra and Schmidt 2008). The data recovery program was developed and implemented by DOE in compliance with a Programmatic Agreement (PA) that was entered into by the DOE, Advisory Council on Historic Preservation (ACHP), SHPO, and the County of Los Alamos. The PA implemented mitigation measures to resolve adverse effects from the conveyance of properties to the County of Los Alamos for future development.

One- to Three-room Structures

As part of the LC&T data recovery program, intensive excavation and comprehensive artifact and sample analysis was conducted on 25 Coalition to Classic period Ancestral Pueblo one- to three-room structures or fieldhouses (Vierra and Schmidt 2008). Three of the structures were located in Cañada del Buey directly north of the community of White Rock, one on the mesa between Pueblo and DP Canyons, and 21 in Rendija Canyon. Architectural analysis indicated that there were four types of structures. Artifact and sample analysis, however, indicated that they were not functionally different, although one- to three-room structures with hearths and perhaps those with larger interior space were more intensively occupied or utilized for a longer period. The data recovery program established that the function of the one- to three-room sites was related to agriculture and to a lesser degree wild plant gathering. For those one- to three-room structures in which an agricultural function could not be established, this function was not contraindicated by either the architecture or the artifact and samples analyses (Lockard 2009).

With data recovery conducted on a large, diverse, and representative sample of these structures, it is not likely that additional data recovery at these kinds of structures would provide additional information. There are currently 420 one- to three- room structures at LANL, and LANS is currently preparing a Fieldhouse Context to describe these structures. To provide a more holistic picture of 1–3 room structures on the Plateau, LANS is also incorporating archaeological data from similar structures at Bandelier National Monument. With limited variability in topographic settings across the Laboratory and Bandelier National Monument, there will be limited potential for the remaining one- to three-room structures to contain additional significant information concerning the nature and function of these sites. Once this context is complete the Field Office will propose a strategy to mitigate this class of sites to the SHPO.

A major consideration in moving forward with a mature CRMP includes developing strategies to address historic properties situated in the developed areas of the Laboratory where the vast majority of mission-related activities is undertaken. Proactive eligibility assessments of the historic properties located in these areas would be beneficial for future cultural resource management as well as project planning and development. For some sites, DOE will explore the

potential to develop alternative ways to resolve potential adverse effects. The goal is to develop mitigations that benefit historic properties and their management through collaboration (e.g.; Cultural Resource Management Online 1999; Transportation Research Board 2005). These creative mitigations could include programs to increase the public awareness of LANL cultural resources and the resource management program. Other potential mitigations could involve the stabilization or repair of sites and preparation of National Historic Landmark or Register nomination forms for sites or districts that are uniquely significant as cultural properties and traditional cultural properties. Development of creative mitigations require consultation with affiliated Native American groups, other stakeholders such as local communities and the general public, as well as with the SHPO and the ACHP.

Creative mitigations may involve investing in the more significant sites at LANL, where the benefits to the overall cultural resources management program outweigh the loss of information from these sites. These creative mitigations can facilitate the management of critical resources at LANL, advance the historic values of the alternative resources selected for investment, enhance the public-information component to cultural resources compliance, increase flexibility in land-use decisions, and satisfy the mutual interests of all active participants. DOE will use the Fieldhouse Context as a starting point to work with the SHPO and the ACHP.

Canyon-Bottom Artifact Scatters

Geomorphic studies at LANL have established that settings with the lowest potential for archaeological site preservation occur along the margins of mesas or canyon bottoms because of runoff and erosion and the exposure of bedrock (Reneau 2006, LANL 2014). Widespread erosion during the middle- to late Holocene period occurred across most of the LANL landscape (Drakos and Reneau 2008). This resulted in 1.5- to 2-meter-thick mixed Holocene deposits as observed in Cañada del Buey, Los Alamos, and Pueblo Canyons. Although these middle- to late Holocene canyon-bottom deposits generally overlay late Pleistocene and early Holocene deposits that could contain intact Paleoindian or Archaic-period cultural remains, surface artifact scatters are in secondary context and have no potential to retain site structural properties, rendering them ineligible to the Register. Shovel testing and geomorphic analysis conducted within the bottom of Mortandad Canyon (LANL 2014) indicated that canyon-bottom sediments do not contain intact subsurface sediments and result from alluvial and colluvial sediment transport. Although some artifacts were observed during shovel testing, the small fragmentary nature of the artifacts, combined with the information obtained from the geomorphic analysis, suggests that the artifacts are in a secondary context (LANL 2014).

Los Alamos and Pueblo Canyons are located along the northern portion and Cañada del Buey in the central portion of LANL, so it is likely that the middle to late Holocene depositional deposits will be found in canyon bottom settings across the Laboratory. The expedient testing of scatter sites located in canyon bottom settings would establish their contextual setting. Testing could be in the form of backhoe trenches on large sites and 1 by 1 meter test units on smaller sites. A canyon soil assessment and testing program conducted by the cultural resources staff and geomorphologists could map the location of mixed Holocene canyon deposits to facilitate eligibility assessments for all Laboratory scatter sites located in this context.

Bedrock Artifact Scatters

Artifact scatters that have been deflated with the remaining artifacts lying on bedrock have no cultural context and are not eligible to the Register. Geomorphic assessments conducted in conjunction with field checks and Geographical Positioning System modeling could be conducted to identify mesa tops where significant erosion has exposed bedrock, streamlining eligibility assessments.

Archaeological Site Significance and Eligibility Standards, the LANL CRMP, and Continuous Improvement

In 2006, the Field Office, and LANS developed a CRMP, outlining the manner in which the NHPA would be implemented at LANL (LANL 2006). The site significance and eligibility standards presented in this document are intended to support the LANL CRMP by providing guidance and recommendations based on current knowledge. As the cultural resources program accumulates new data, this information will be integrated into subsequent updates. The CRMP and these standards are living documents designed to facilitate the process of continuous improvement in cultural resources management and compliance at LANL.

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